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AVIATION

The Oldest American Aeronautical Magazine

DECEMBER 1, 1928 Issued Weekly PRICE 20 CENTS

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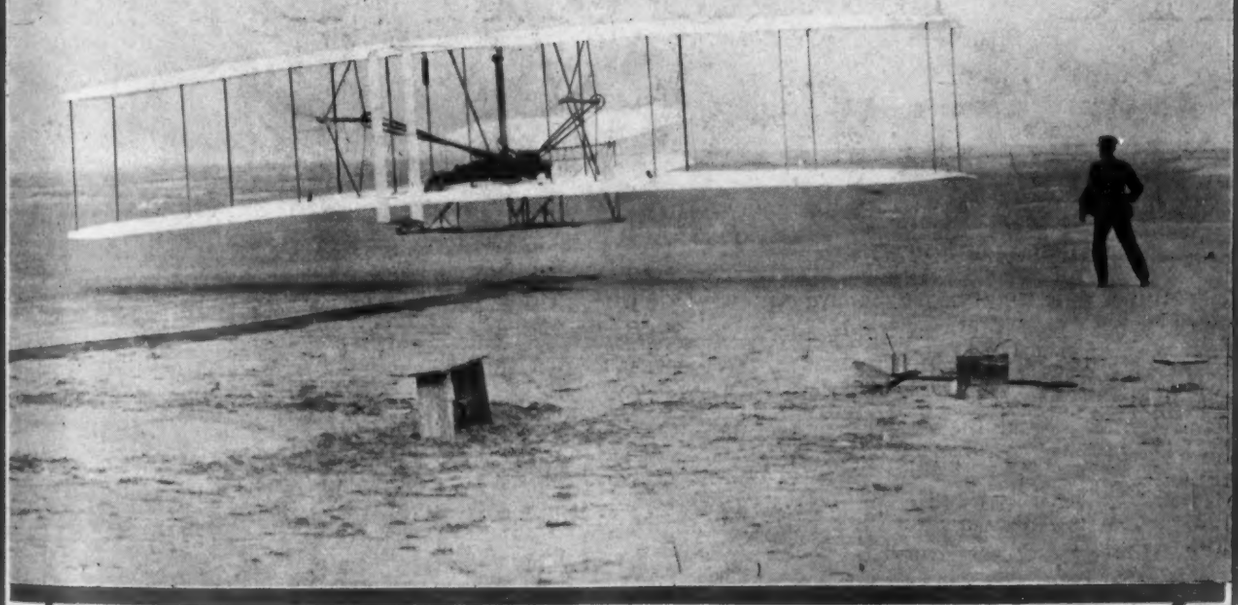

Orville Wright making the first flight in a heavier-than-air craft, Dec. 17, 1903

VOLUME XXV

NUMBER 23

25th Anniversary of Flight Number

AVIATION PUBLISHING CORPORATION
250 WEST 57TH STREET, NEW YORK

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Airplane engine manufacturers are equipping with Heald AUTOMATIC Internals for grinding the holes in cylinders, rods, pistons, bushings, bearings and all other moving parts, as they find AUTOMATICS universal in regard to the character of the hole to be ground and the size of the lots to be finished.

Complete literature on how Heald handles airplane engine parts sent on request.

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WORCESTER MASS., U. S. A.
Has held the confidence of the trade for over 100 years

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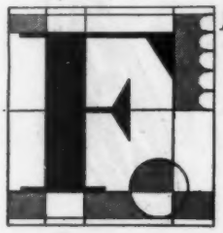
"When you see their plants you *know* these men are in the business for keeps"

We have three new planes...

. . . and a dealer plan that will get your banker's interest and respect



AIRCHILD is offering for 1929 three new planes of proven design – the 21, the 41 and the 71.

Each is, we believe, the most advanced development in its class.

We expect that the Fairchild line for 1929 will be of great interest to the dealer, the operator, the pilot and the public. The planes will be on display at the Show in the Coliseum at Chicago, December 1st to 9th, and in the air at Municipal Field.

And, we will be ready there and then to discuss a dealer plan as advanced as the planes – *and as sound.*

A dealers' proposition which will instantly command the attention and respect of your banker . . . . Fairchild Airplane Manufacturing Corporation, Farmingdale, L. I., N. Y.

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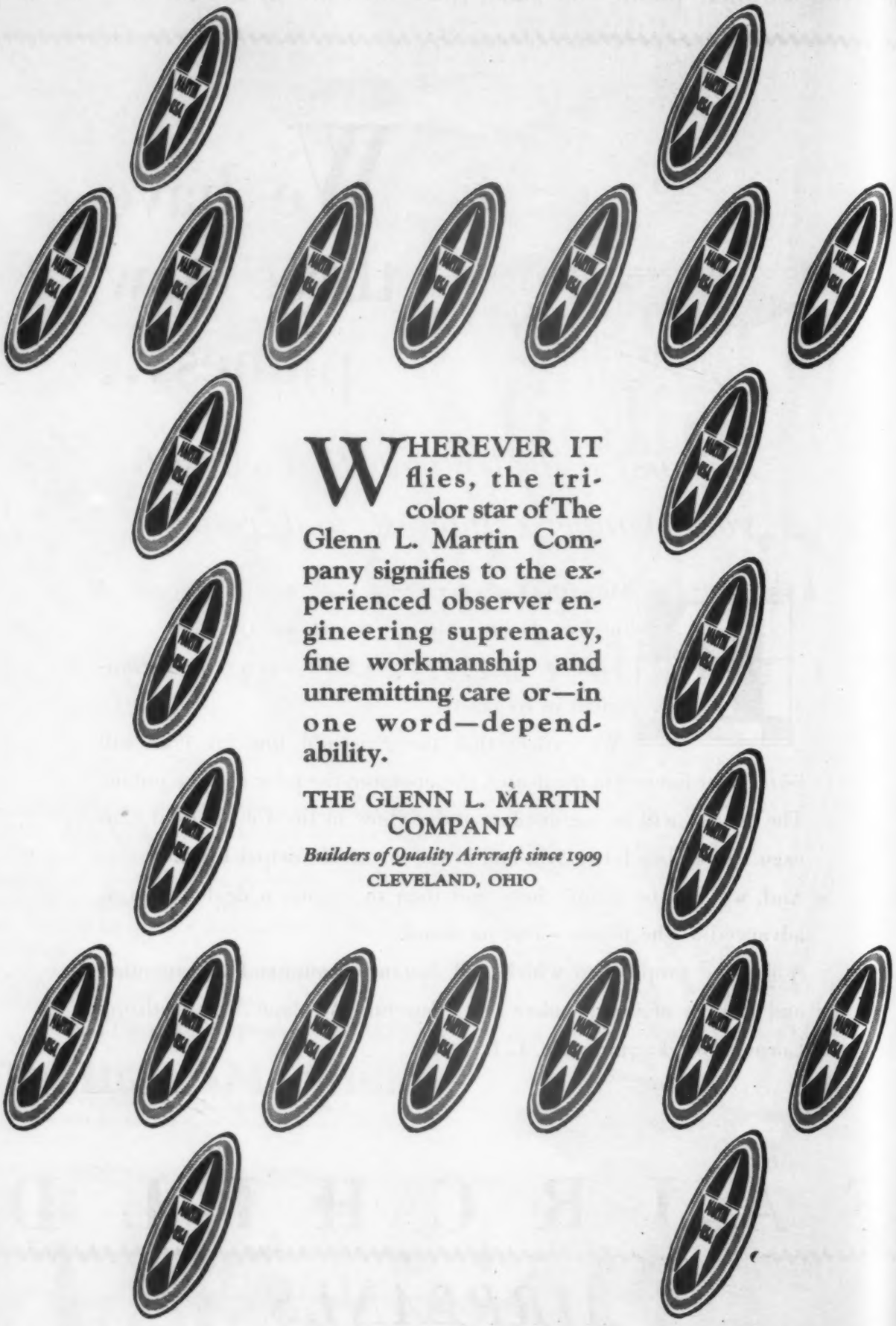

WHEREVER IT flies, the tri-color star of The Glenn L. Martin Company signifies to the experienced observer engineering supremacy, fine workmanship and unremitting care or—in one word—dependability.

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Builders of Quality Aircraft since 1909

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Aviation's silver jubilee

Mobiloil

celebrates . . .

a quarter century of brilliant achievement in the air

THIS month marks the twenty-fifth anniversary of man's first successful flight in a self-propelled heavier-than-air machine. On December 17, 1903, at Kitty Hawk, N. C., Orville and Wilbur Wright proved to an incredulous world that their awkward box kite could rise from the ground and fly through the air under its own power, carrying a pilot.

That epochal event opened up a new field for automotive engines, in which correct lubrication was of vital importance. Early aviators found that the best results were obtained with an oil which was even then used everywhere in automobile engines—Gargoyle Mobiloil. Mobiloil's dependable quality and widespread distribution proved doubly attractive to those first hardy pilots whose crude planes were apt to need refuelling in out-of-the-way places.

From the earliest years Gargoyle Mobiloil has played an outstanding part in the thrilling pageant of events that have made up aviation history. Here are a few of the famous flights made with Mobiloil:

The Wright Brothers' early flights.

Glenn Curtiss' famous non-stop flight from Albany to New York in 1910, and other flights.

The U. S. Army aviators during the War.

Lieut. Maughan's first dawn-to-dusk flight across the United States.

The U. S. Army fliers round-the-world flight.

Commander Byrd's flight to the North Pole.

Art Goebel's Dole Prize flight from San Francisco to Honolulu.

Colonel Lindbergh's flight from New York to Paris, and his good-will trip to Mexico, Central America and the West Indies.

Amelia Earhart's spectacular flight across the Atlantic.

You will find Mobiloil on sale at, or conveniently near, every airport in the world.

The World's Quality Oil

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VACUUM OIL COMPANY

WACO typifies the amazing strides

SEE *the complete display of* WACOS *at the Chicago Show, December 1st to 9th*

* * *

Look back to the Wright Brothers' assemblage of bamboo, piano wire and silk . . . its elevator fore and rudder aft . . . with complicated controls, and heavy motor turning twin propellers behind. Yet it flew at Kitty Hawk in December twenty-five years ago.

Today . . . what a difference between the "flying machine" of 1903 and a WACO! From minutes of hazardous hops to hours of safe air travel. From frail craft to trustworthy WACOS which fly millions of miles every season throughout the year.

Examine a WACO at the Chicago Show, December 1st to 9th. You'll see factors of safety in construction surpassed by no commercial plane at any price.

Go over a WACO part for part, from nose to tail. Check its sturdy motor mounting . . . its perfect streamline and minimum head resistance . . . its clean-cut design, giving lightness with strength and grace with stability in flight.

Consider these other typical WACO values: wireless, tube-braced fuselage; four narrow chord ailerons operated without

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MANUFACTURED BY ADVANCE AIRCRAFT CO., TROY, OHIO

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These facts explain why WACO production is far ahead of all others . . . why WACO prices are surprisingly low . . . why more WACOS dot the sky than any other make of aircraft used for commercial or pleasure flying.

Arrange to fly a WACO if you've never done so. Judge its performance in the air . . . its ability to take off and land safely in the smallest fields. WACOS are powered with OX-5, Siemens-Halske, Hisso or Whirlwind motors, Department of Commerce Type Certificates 9, 13, 26, 41, 42. Reasonably prompt deliveries. Write for WACO Catalog A-12.

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RECORD BREAKING PLANES

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2. Southern Cross which flew to Australia.
3. Waco 10 winner of the 1928 Reliability Tour.

52 out of 61 planes starting the 1928 National Air Races were protected with Flightex. The majority of the prominent airplane manufacturers specify Flightex Fabric.

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62% LIGHTER THAN IRON

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Your attention is particularly directed to the Bohn exhibit at the forthcoming International Aeronautical Exposition in Chicago, at which we will display the following vital motor parts: *Pistons, Crankcases, Cylinder Heads, Bohn Bronze Valve Seats and Valve Stem Guides, Bohn Bronze Forgings, Bohn Die Castings,* and innumerable other parts for air cooled and water cooled engines, also control parts for aircraft.

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"The finest plane of its type I have ever seen"!

Commander Byrd writes—"I am much pleased with the results of our tests and compliment you upon the design and construction of this plane.

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said Lieutenant Bernt Balchen, Chief Pilot and second in command of the Byrd Antarctic Expedition, after his exacting flight tests of a stock model of the Aristocrat three-place cabin plane.

Commander Richard E. Byrd, one of this country's best informed aeronautical authorities, was equally enthusiastic after he had made his first flight in the Aristocrat, which is the only small plane he has taken on his Antarctic Expedition.

Actions Speak Louder Than Words

Commander Byrd and Lieutenant Balchen chose the Aristocrat in preference to any other small plane in the world in which to repeatedly risk their lives in one of the most hazardous undertakings in the history of exploration.

Follow the example of these aeronautical experts. Play safe!

See the Aristocrat

at the International Aeronautical Exposition, Chicago December 1st to 9th, 1928—Space Center of Main Floor

Lieut. Bernt Balchen, aeronautical engineer and world famous trans-Atlantic flyer, has flight-tested most of the well-known makes of planes in America and Europe and is recognized as an authority on airplane design, construction and performance.

GENERAL AIRPLANES CORPORATION, 552 *Abbott Road, Buffalo, N.Y.*

GAC

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The Aristocrat of the Air

The plane you have been waiting for!

The Aristocrat Airplane, designed and built by an organization which contains some of the ablest aeronautical engineers and manufacturing executives in the world, has raised the standards of airplane quality and performance to new high levels.

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Greater safety and dependability have been attained by providing a generous margin of strength and greater inherent stability and ease of handling.

Involuntary "tail spinning," most frequent cause of air accidents, has been eliminated. It is impossible to hold the Aristocrat in a voluntary "tail spin." At stalling speed, with the engine cut off, the Aristocrat simply assumes its natural gliding angle.

You can fly the Aristocrat "hands off" under normal weather conditions, using only the rudder and throttle for control.

The Aristocrat provides maximum visibility for pilot and passengers.

Better All-around Performance

Better all-around performance has been attained by producing a design scientifically correct and perfectly balanced.

The Aristocrat takes off with a full load in less than five seconds in a normal wind of ten to twelve miles per hour. It climbs 800 feet per minute and has the extremely low landing speed of 36 miles per hour. Its cruising speed is 95 miles per hour and high speed 120 miles per hour.

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The Aristocrat flies 17 miles to the gallon of gasoline with full load and is designed to permit repairs and replacements with a minimum of time and effort.

Built by Master Craftsmen of the best materials that money can buy, rigidly tested and inspected, the Aristocrat provides the maximum of safety, comfort, performance, durability and economy of operation and maintenance.

In addition to the Aristocrat, we also manufacture a complete line of commercial airplanes of advanced design, including a seven-place plane, ten-place plane, fourteen-place plane and a model designed especially for taking photographs and making surveys from the air.

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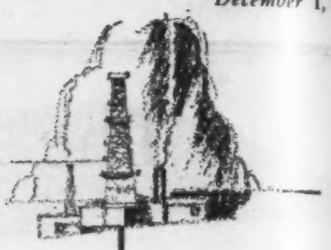

How OIL has *stimulated* advancement IN AIRPLANE MOTOR BUILDING

1½ miles underground...boiling temperatures...sand-laden crude oil...tons of weight...and only 3 inches to work in.

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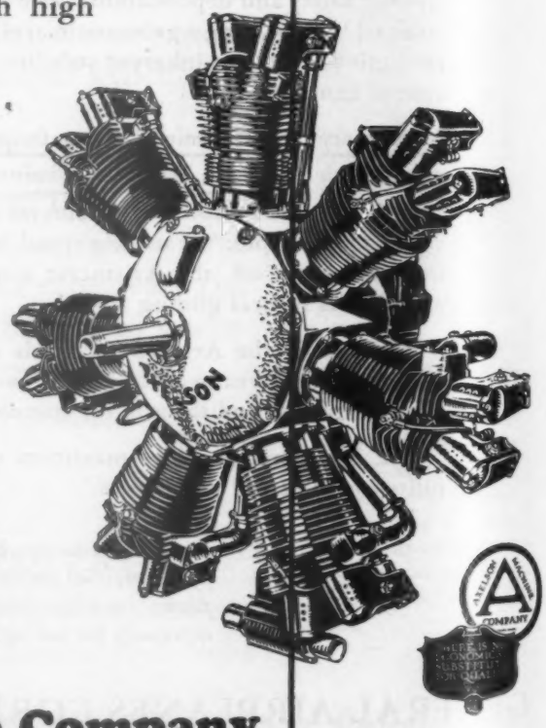
...into the earth drives the drill...*oil is struck!*...eventually the well must be placed on the pump...and down a mile and a half goes an Axelson Pump, encased within a tube 2½ or 3 inches in diameter. Day in and day out for hundreds of hours that pump must serve. It dare not falter. The slightest inaccuracy in finish, the slightest flaw in metal—and the pump would fail. Few tools are made that require such accuracy, such exacting tolerances, such highly developed metals, as Axelson Oilwell Pumps. It has required 37 years of progression to attain such high quality and to develop such fine characteristics of workmanship.

The *same* attributes of quality, the same painstaking refinements, the same standardization of parts, are reflected in *Axelson Airplane Motors.* The fact that Axelson standards of precision were perfectly adaptable to fine motor building, supported by financial resources capable of expanding without restriction or confusion, *prompted* Axelson to establish the Airplane Motor Division.

Full production is being rapidly approached and negotiations now under way will result in the most comprehensive system of motor distribution and servicing ever attained.



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-TP- Aero, the original and only all paraffin base ZERO POUR TEST oil, will keep its fluidity as low as *40 degrees below zero.* This is a straight run and not a blended or compounded oil. Its wax free feature is responsible for its low cold test as well as its outstanding fluidity at extremely low temperatures. It also holds its viscosity at extremely high motor temperatures. It is an entirely new oil, made especially for aircraft motors. If your dealer cannot supply you, advise us.

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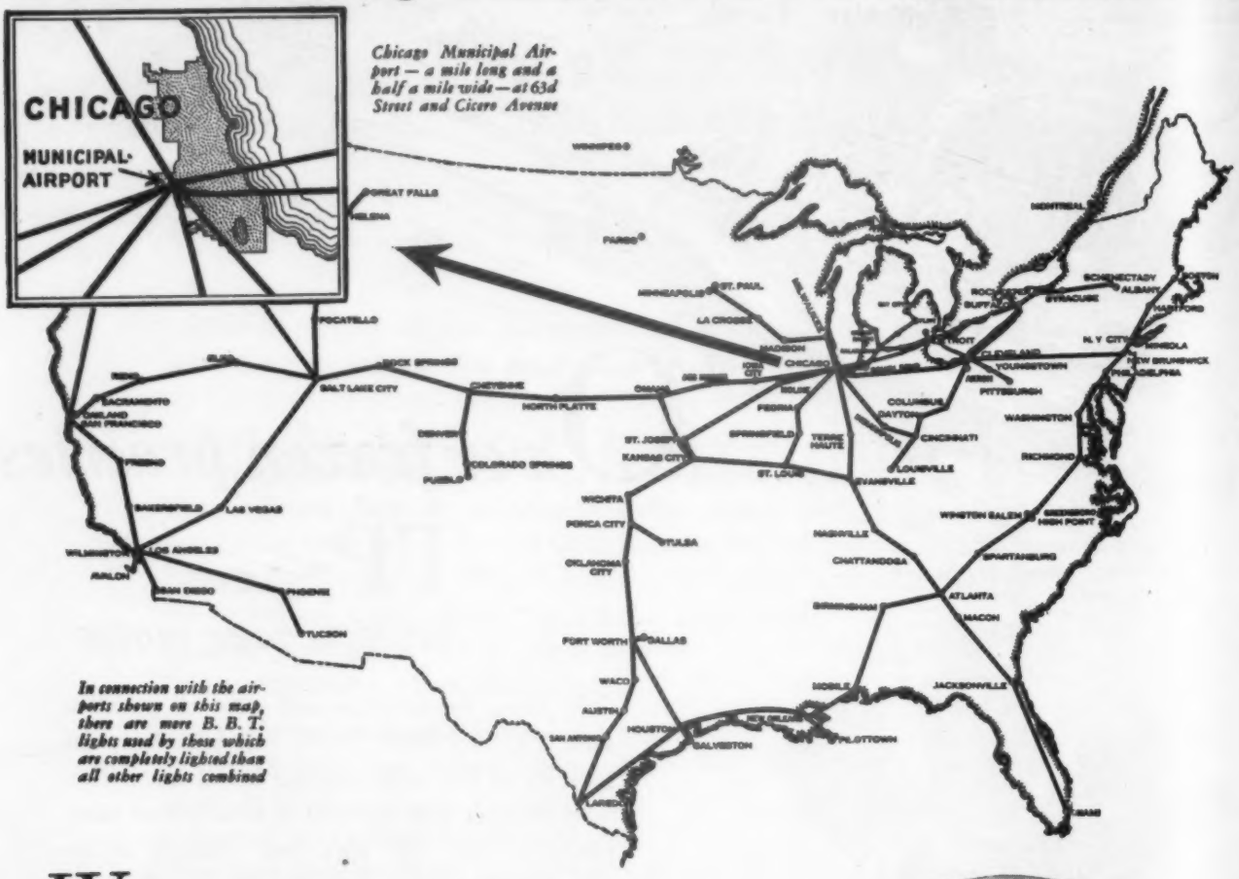
CHICAGO
MUNICIPAL AIRPORT
Chicago Municipal Airport — a mile long and a half a mile wide — at 63d Street and Cicero Avenue
In connection with the airports shown on this map, there are more B. B. T. lights used by those which are completely lighted than all other lights combined

WHEN in Chicago do not fail to visit the Municipal Airport at night and see this extraordinary floodlighting of daylight intensity.

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For every type and size airport, there is a B. B. T. Floodlight, each having the same exceptional features—Fresnel lens—sharp cut off—even light distribution—high intensity—180 degree area of illumination—reliability of performance and economy unequalled by any other system.

Recommendation for the lighting of any airport — large or small — will be furnished on request

Write for our illustrated catalog, "Airport Lighting"

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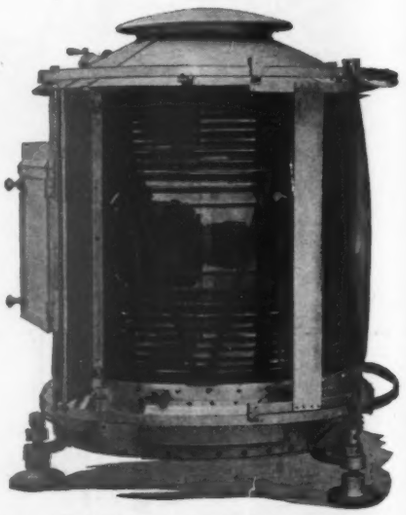

B.B.T. Air Mail Type M-8-D Floodlight
Four of these units have been installed on the Chicago Municipal Airport and furnish the illumination for the landing or taking-off of twenty-two or more planes every night

ANTHONY H. G. FOKKER

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Hence the sound increase in Fokker production facilities since January 1, 1928. Instead of one, we now have three coördinated plants, and plans for constructing a factory on the Pacific Coast, which will surpass all present facilities, well under way. Our Teterboro Airport, N. J., plant with the newly constructed assembly hangar, and the space available in our Passaic, N. J., factory, provide us with a floor area of over 300,000 sq. ft. for the expansion of our manufacturing operations. At the new Glendale plant, Wheeling, W. Va., which was constructed for the exclusive production of our large commercial types, the first unit of 100,000 sq. ft. is now in full operation. Here is evidence of what may be expected in 1929.

Fokker is the first airplane manufacturer to offer a complete line of types. Those now in regular production include:

The 4 to 6 passenger UNIVERSAL (Whirlwind). The 6 to 8 passenger SUPER-UNIVERSAL (Wasp, Hornet, Cyclone or Jupiter). The 10 to 12 passenger F-7 TRIMOTOR (three Whirlwinds). The 14 passenger F-10 SUPER-TRIMOTOR (three Wasps). The new 6 to 8 passenger Amphibian Flying Boat (Wasp, Hornet or Cyclone). And the F-12, with day accommodations for 32 passengers and night accommodations for 16, now under construction.

These facts show how American enterprise has rapidly developed a name and product prominent in the world's aviation during 17 years. Present-day facilities confirm our offer of prompt manufacture, although the fast-growing demand indicates the advisability of ordering now for spring delivery.

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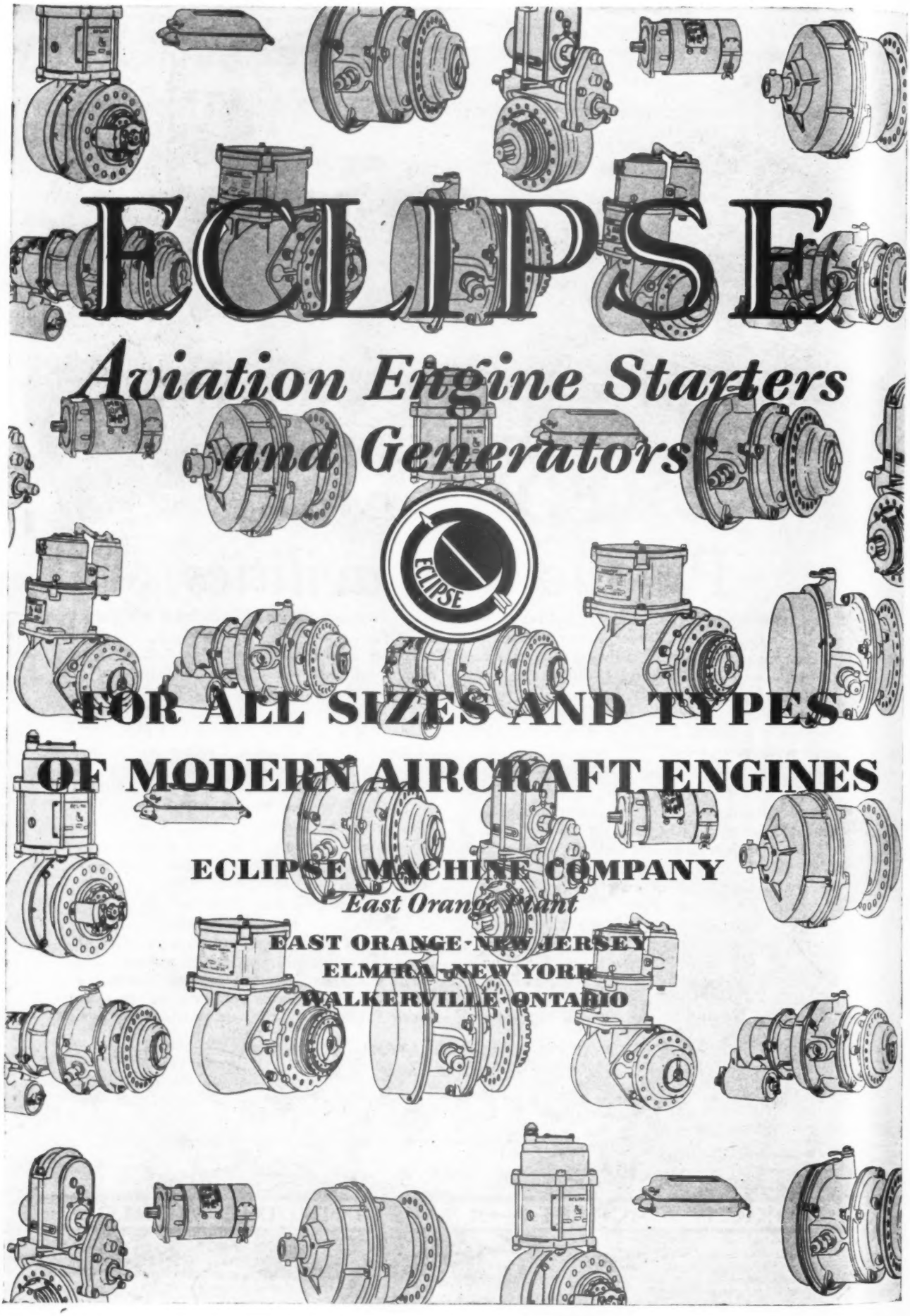
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Phillips Aviation

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Built for operators and corporations whose executives must fly to fulfill important engagements.

The pilot's compartment is separated by a partition so that conversation can be carried on without interference.

Equipped with Wright Whirlwind engine and licensed to carry a useful load of 1628 lbs. High speed, 120 M.P.H.

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Built either single or dual control, with space for two passengers, and an ample baggage compartment.

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Buhl Aircraft Company

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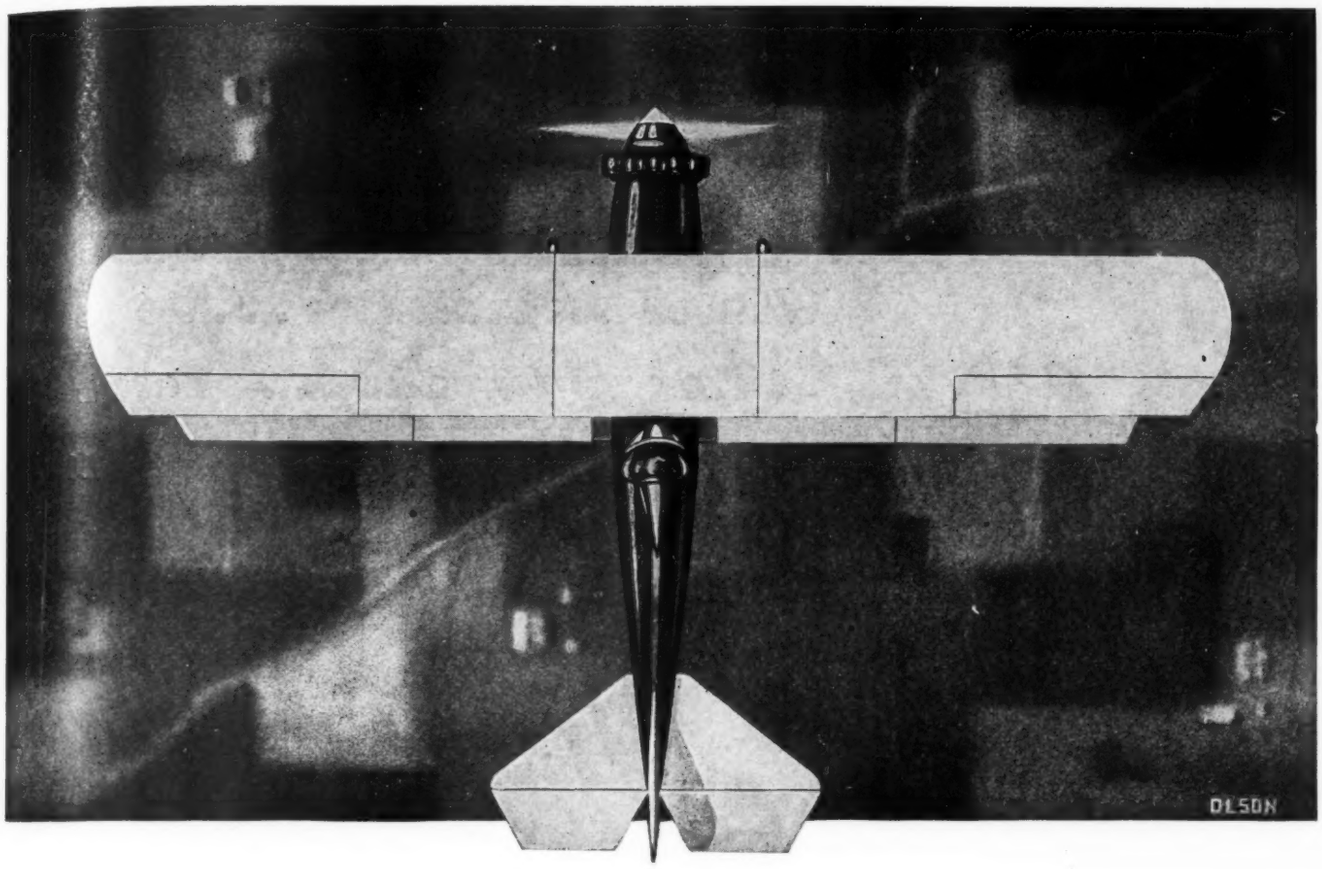

Better go *with* Alexander

Airplane selling presents attractive inducements at this stage of aviation development. It is the logical way toward participation and growth in this rapidly expanding industry.

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Alexander Aircraft Company maintains a group of sales promotion men who fly constantly, helping distributors and dealers realize more sales from their territories. It conducts a perpetual advertising campaign through national magazines, direct mail and motion pictures. It does everything possible to help its franchise holders build a sound organization.

If you can attend the International Aircraft Show at Chicago, December 1 to 9, do so. It will be the largest and finest aircraft exposition ever held. Talk to our President, J. Don Alexander and our Vice-President in charge of sales, J. A. McInaney, about selling Eaglerocks. They will be with the Alexander Aircraft Company's exhibit.

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Utah—Rocky Mountain Flying Service, 125 E. 1st So. St., Salt Lake City.
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S. Ill. & E. Mo.—Von Hoffman Aircraft Co., 105 S. 9th St., St. Louis, Mo.
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N. Tex.—Wichita Falls Air Transport Co., Inc., 1202 Staley Bldg., Wichita Falls.
S. Car. & Ga.—Williams Flying Service, Box 1319, Greensville, S. C.
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The most complete stock of supplies and equipment in the East.

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The MOHAWK "PINTO"

¶Maximum visibility, utmost stream lining and the "ground cushion" . . . all these have been commandeered to give you safety in the busier skies, swift grace at the touch of your hand and soft, easy landings. ¶Two years of development and research have been expended in perfecting the most faithful personal and instruction plane that air engineering can produce. ¶ High-lift low wings ease you off and help you on, and defy inadvertent spins. The "Pinto" won't spin from a stall or a tight spiral¶ Here is a plane which with all its advantages is low in price and economical to fly. It is rapidly winning the favor of experienced pilots as well as students. ¶ Desirable territory is still available for responsible distributors. Write for complete information.

Mohawk Aircraft
CORPORATION

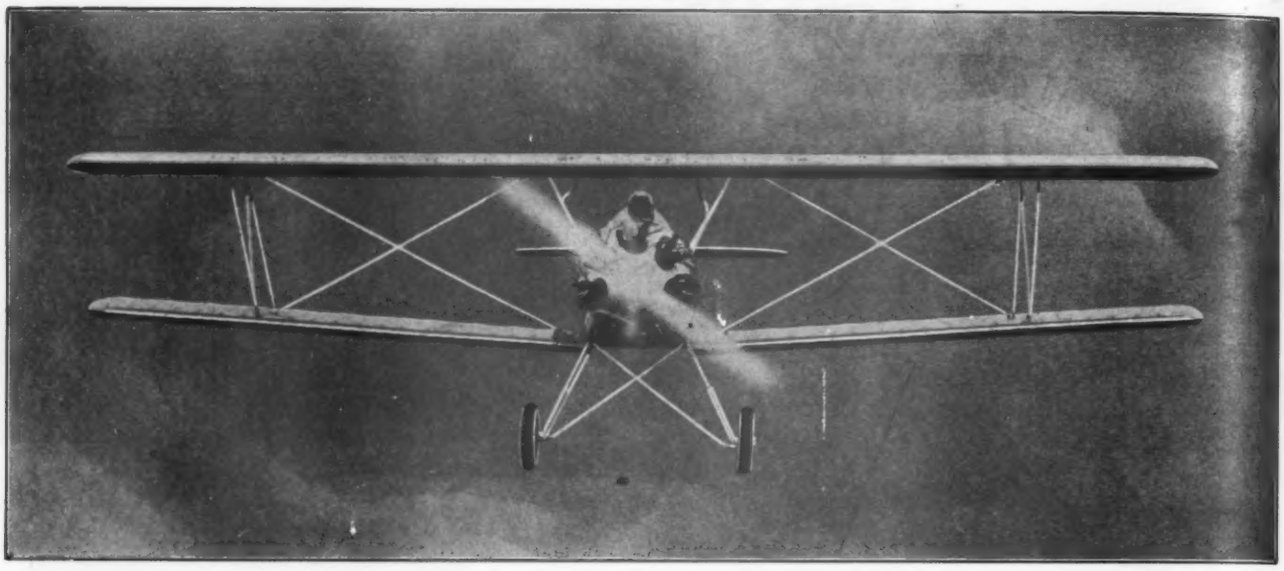
2601 Delaware St. S. E.
Minneapolis, Minn., U. S. A.

Price, Complete, with Velie Power Plant $2775.00 Flyaway Field Minneapolis, Minn.

Visit Our Exhibit at the International Aeronautical Exposition at Chicago December 1st to 8th

MOHAWK AIRCRAFT CORPORATION

The safest and most



THE CONSOLIDATED HUSKY JUNIOR

U.S. Department of Commerce Approved Type Certificate No. 84

EIGHT years of intensive aircraft engineering applied exclusively to the design, manufacture and development of training airplanes makes the record of CONSOLIDATED a unique one in this field.

More than 700 CONSOLIDATED HUSKIES are now in daily service—constantly subjected to the manhandling and mishandling of student flyers. Flown over 15 million miles of record—four times as much as any other type.

CONSOLIDATED HUSKIES operated at 140 different stations throughout the Western Hemisphere—ranging from the bitter cold of the Far North to the steaming heat of the Tropics.

Over 4,000 students have been trained to fly in CONSOLIDATED HUSKIES—more than in all other types combined since the World War. Fewer casualties with more than four times as much flying as in any other type. Never a fire in a CONSOLIDATED HUSKY, either in flight or on the ground.

CONSOLIDATED HUSKIES have never worn out nor been condemned. Many HUSKIES have a record of over 1,000 hours — 75,000 miles — without overhaul. Unequalled by automobiles.

Simplicity of design, sturdiness of construction and ease of maintenance have reduced the necessary ground crews 50 per cent.

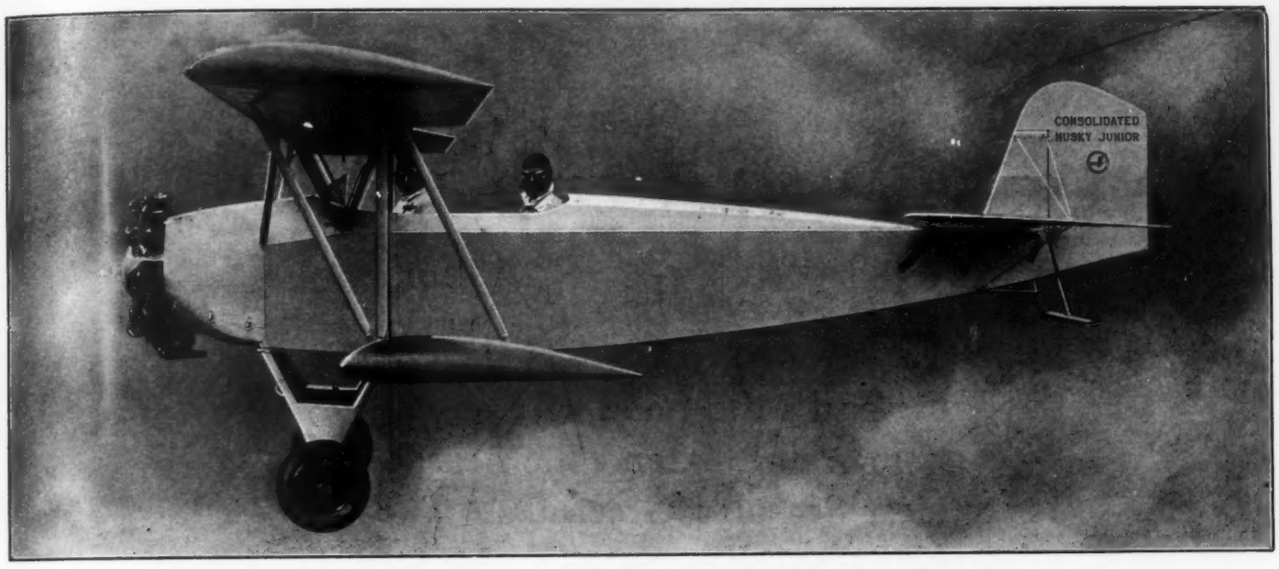
CONSOLIDATED HUSKIES, after open competition, have been adopted as standard for training by the U. S. Army Air Corps, Naval Air Service, National Guard, Marine Corps, Organized Reserves, Naval Reserves, and by the Royal Canadian Air Force, Cuban Army Air Corps, Brazilian Naval Air Service, Peruvian Army Air Corps and the Siamese Army Air Corps.

Youth of today with its spirit of accomplishment is rightly looking to Aviation for its opportunity. No invention in history ever offered such possibilities to the ambitious young man as this latest, fastest and finest means of transportation.

Flying for pleasure and as a business appeals to everyone. The business of operat-

SEE THE CONSOLIDATED HUSKY JUNIOR AT THE CHICAGO

economical training plane



ing airplanes commercially is growing by leaps and bounds —creating a demand for capable pilots that cannot be met by the supply. Transcontinental air mail and transport lines are drafting all available pilots who have sufficient experience—likewise the great network of feeder lines and independent operators are searching for more skilled pilots to handle the ever-increasing volume of business.

More and better flying schools are needed to teach "air-minded" youth to operate this new commercial air fleet now building, the world over.

The two prime requisites for reputable flying schools are, first, proper training airplanes, and second, a reasonable number of hours training course. The two leading considerations for prospective pilots are, first, the reputation of the flying school, and second, the character of its equipment. A student pilot in fairness to himself and his family should select a school equipped with CONSOLIDATED HUSKY JUNIORS. Schools of good repute should not hazard their very existence on the use of anything but the best which is always the most economical in the long run.

In CONSOLIDATED HUSKY JUNIORS, the student as well as the instructor benefits through the greater confidence instilled by their use. The student learns the nicety of feel, the co-ordination of controls and develops the proper "flying sense" much more quickly and safely in the HUSKY JUNIOR. Ground crews can be greatly reduced and these planes still kept "on the line ready to go" day in and day out.

The CONSOLIDATED HUSKY JUNIOR is the logical and obvious development of a long line of leaders in its field—and is offered to flying schools, independent operators, business men, sportsmen and to student graduates, as the acme of training and sports aircraft.

CONSOLIDATED AIRCRAFT CORPORATION
2050 ELMWOOD AVENUE, BUFFALO, NEW YORK

Consolidated
AIRCRAFT

Greetings from the Kendall Hangar!

Nothing
would give
us more pleas-
ure, as the Holiday
Season approaches,
than to visit every field,
grasp the hand of every
man and extend the heart-
iest Season's Greetings ⋄ The
KENDALL REFINING COMPANY
are not unmindful of the many
courtesies extended their representa-
tives by the manufacturers, the sales
managers, the pilots and the mechanics and
to attempt to write each one would mean that
many would be overlooked ⋄ We realize the
opportunity that Aviation offers and have tried in
every way to merit your confidence. The friendships
that we have formed are a source of deep gratification
to us and it will be our aim to continue to do everything
within our power to show that we are interested in and
want to be considered a part of Aviation ⋄ That the industry
may prosper and that you as individuals may enjoy the fruits
of your efforts, coupled with our best wishes for a very
Merry Christmas and a Happy New Year,

is the
sentiment
of the

KENDALL REFINING COMPANY
BRADFORD, PA.

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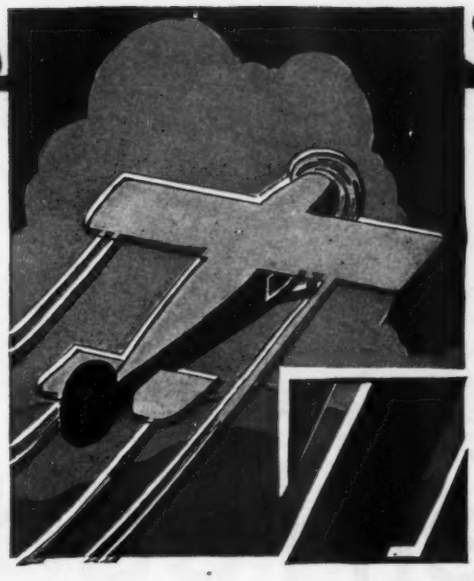


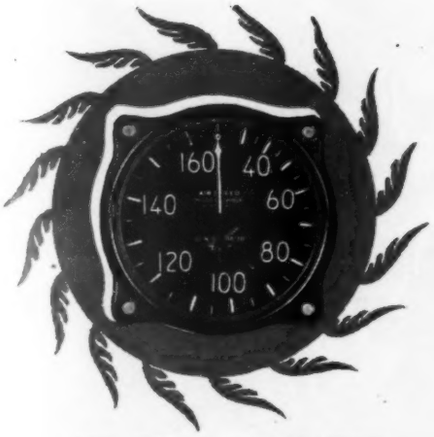
"STEADY NERVES OF THE PLANE"

OOMING from the take-off to gain altitude . . . climbing through agitated clouds to hurdle mountain peaks . . . whenever your plane noses skyward, your Consolidated air speed indicator warns you when the dangerous stalling moment is near.

Like all Consolidated precision-built instruments, the steady nerves of the plane, the air speed indicator is accurate. The expertness of the craftsmanship that produces this exactly balanced instrument guarantees its precision in performance.

The new Bakelite case eliminates corrosion and protects the delicate mechanism of the air speed indicator from plane vibration and interference by atmospheric conditions. Ease of reading is insured by the large, well defined figures, the prominent gradation marks, and the tiny spade of the hand.

Address Dept. I for illustrated booklet and complete information regarding Consolidated precision-built instruments



AIR SPEED INDICATOR
New 2¾ inch diameter dial
Standard Range, 0—160 M.P.H.
Special Ranges supplied on request

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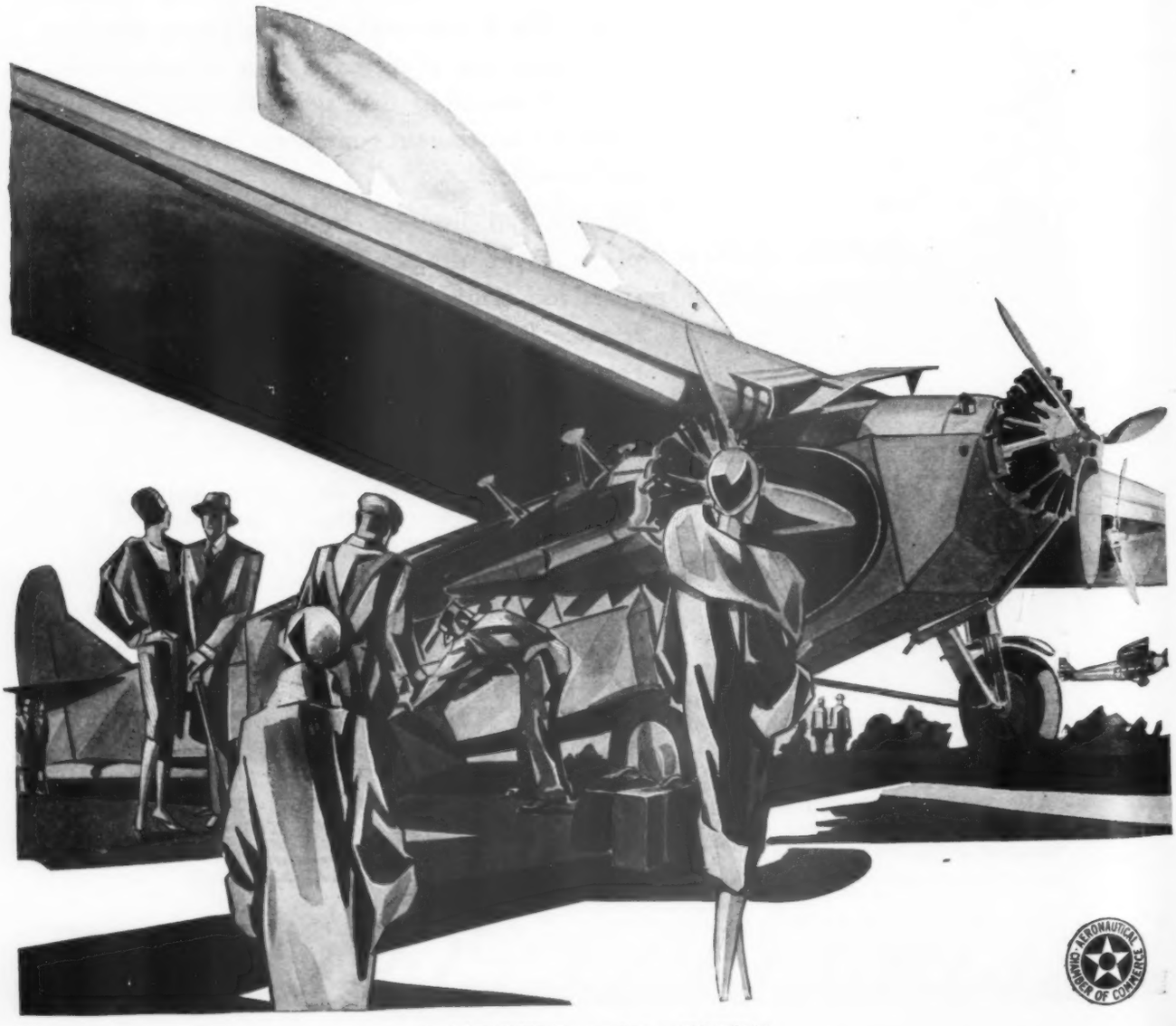
95% OF ALL U. S. COMMERCIAL AIRCRAFT USE CONSOLIDATED INSTRUMENTS

PRATT & WHITNEY U.S.A.
DEPENDABLE ENGINES

The "open road" lies



AERONAUTICAL CHAMBER OF COMMERCE

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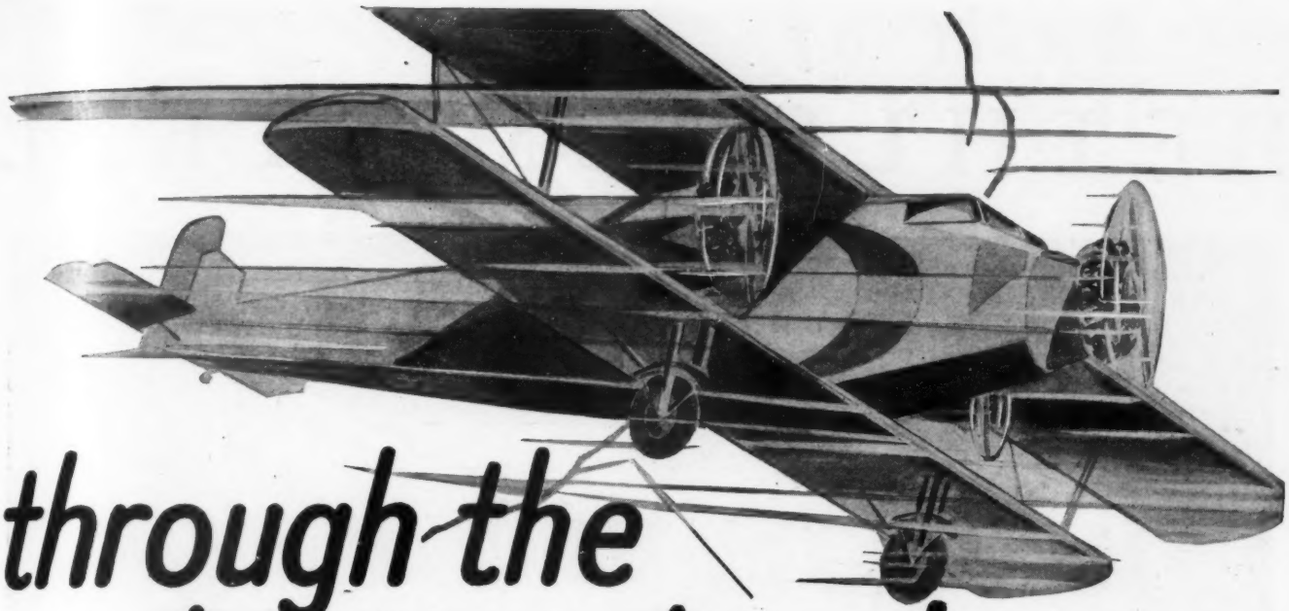

through the charted skies!

The progress of civilization is written in terms of transportation. Commerce has walked, sat in saddles, been pulled by steam and carried on pneumatic tires as history turned succeeding pages. Still the demand for greater speed continues. Today commerce takes wings, and leaps bullet swift through the charted skies.

Boeing, Ford and Fokker trimotored transports, flying on regular schedules, and operated by several great transportation companies are making transcontinental passenger service by air an accomplished fact. These super-planes, powered by Pratt & Whitney "Wasp" and "Hornet" engines, represent the last word of science in safe and dependable air transport.

THE

PRATT & WHITNEY AIRCRAFT CO.

HARTFORD CONNECTICUT

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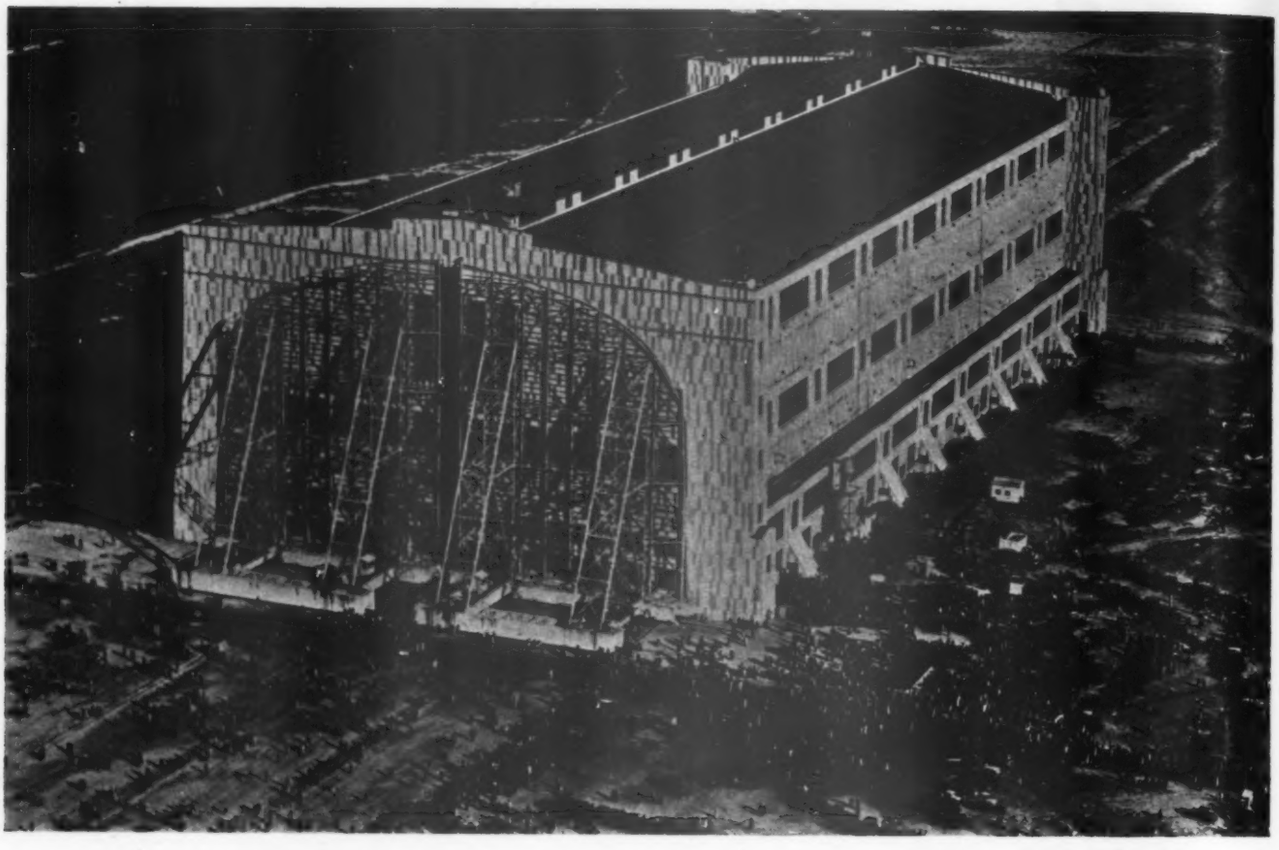
Built of
BETHLEHEM STEEL



The Famous Lakehurst Hangar

THIS great structure, the hangar at the U. S. Naval Air Station, Lakehurst, N. J., is 800 feet long, 200 feet high, more than 200 feet wide—large enough to house at one time both the Los Angeles and the Graf Zeppelin, with room to spare.

The steel framework was built entirely of Bethlehem Structural Shapes. In addition to manufacturing this steel, Bethlehem fabricated and erected it. More than 8,300 tons were required.

* * *

While it is impossible to exaggerate the importance of steel in the construction of aircraft and engines, this immense structure typifies another highly important application of steel in the aeronautical business. In hangars, landing fields, shops and other ground facilities, just as in crankshafts, connecting rods, fuselage structures, wherever dependability, endurance and great strength are needed, steel is the material used.

Whether for use on the ground or in the air, Bethlehem is prepared to supply steel to meet all requirements of the aeronautical industry.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

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3 Points supporting Pedrick supremacy

1-MADE TO SPECIFICATIONS. PEDRICK Heat-Shaped piston rings conform to the specifications of the engine designer. PEDRICKS are approved and used by many leading engine builders. We will send upon request a reprint of an article from the Journal of the Society of Automotive Engineers entitled "Important Factors in Piston Ring Design." It explains why conventional piston rings are best.

2-EVERYWHERE AVAILABLE. The PEDRICK distributing organization is world-wide in its scope. *Everywhere* adequate stocks of PEDRICKS are in the hands of reputable merchants ready to render service. Write now for the name of the nearest Distributor carrying a complete PEDRICK stock.

3-THE WELL KNOWN PEDRICK QUALITY never varies. All PEDRICKS are Heat-Shaped—set to tension by heat. In this process every ring is made round from the start by machining a circular casting. In the last step of the process the finished casting is split and spread open the correct distance to give it the proper tension. Held in this spread position it is set to that correct shape by heating it to 1200 degrees Fahrenheit. Because the setting to this shape under heat is the last operation of the process, the exact desired shape is *always* obtained. Furthermore, the shaping under 1200 degrees Fahrenheit removes all internal stresses which may have been set up by casting, cutting and machining—stresses which, if permitted to remain in the ring *as in all other processes*, would cause the ring to warp or to lose tension. But PEDRICKS cost no more, even in the oil-control type, than ordinary snap rings—25c each, and up.

Wilkening Manufacturing Co.
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Leaders in the

PATRICIAN... *Leader of American Aircraft*

The new 20-Passenger Transcontinental Air Liner—created by Keystone—is ready for Demonstration and quantity Production.

Richly appointed—combining a superlative Performance with the much desired factors

Safety—Comfort—Dependability

this airplane is offered as the multi-passenger transport of the future.

Actual Performance Figures—Full Load

High Speed	151 M.P.H.
Service Ceiling	16500 ft.
Pay Load	3880 Lbs.

KEYSTONE

KEYSTONE AIRCRAFT CORP. BRISTOL, PENNSYLVANIA

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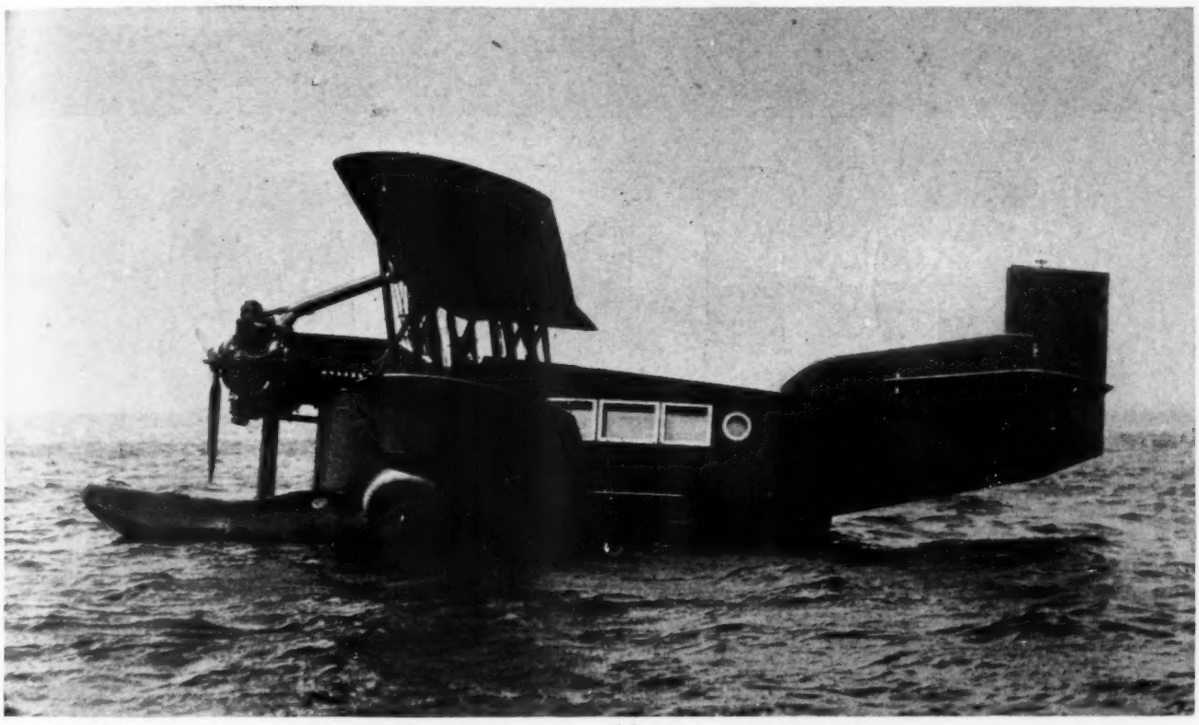
Commercial Field



KEYSTONE-LOENING AIR YACHT

The 1929 Keystone-Loening Amphibian, accommodating 8 passengers—the Safest and Most Practical single engine airplane manufactured. Powered by the 525 H.P. Wright "Cyclone."

Individuals and Commercial Operators desiring Safety, Comfort, Flexibility and efficient Performance—will find this latest Loening development surprisingly well suited to their requirements.

High Speed	132 M. P. H.
Cruising Speed	110 M. P. H.
Pay Load	1500 Lbs.

Built to Government standards—the choice of well known pilots of both Army and Navy Air Services.

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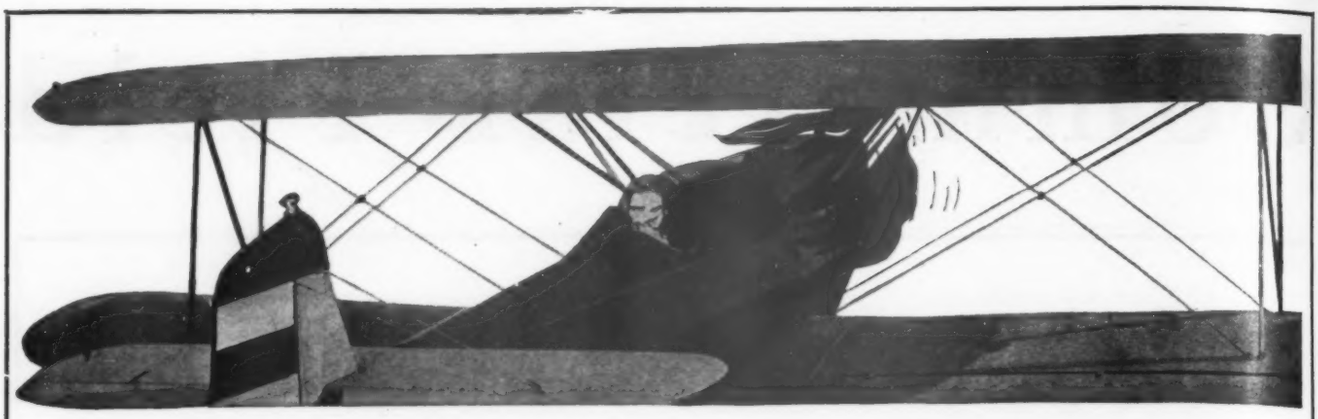

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Out in 5 Seconds

With a Phylax

(Pronounced CFI-LAX)

Aero Type
Automatic Fire Extinguisher

This device is compact and light in weight (only 12½ lbs.), and is so constructed and arranged that the flame itself releases the equipment, and *automatically* extinguishes the fire. This is of great advantage because the pilot may not see the fire until too late, or may not be able to fight it and control his ship at the same time. It may be operated by electricity for multi-engine planes or by hand for use anywhere.

This extinguisher has been thoroughly tested and is foolproof. It is the only automatic fire extinguisher on the market made expressly for airplanes. Is not under pressure—therefore no danger from explosions. Price, $60.00, complete, ready for installation, which requires only a few minutes. For both air and water cooled motors.

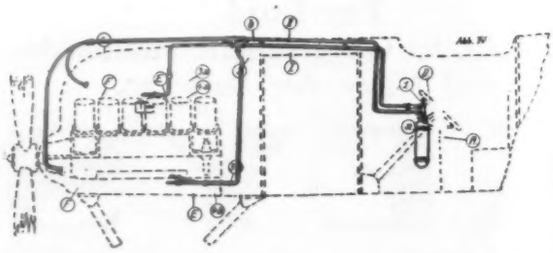
The PHYLAX is Standard Equipment on the German Lufthansa Air Line as well as all planes of the Czecho-Slovakian Army.

Send for descriptive folder—secure the dealership in your city.

PHYLAX

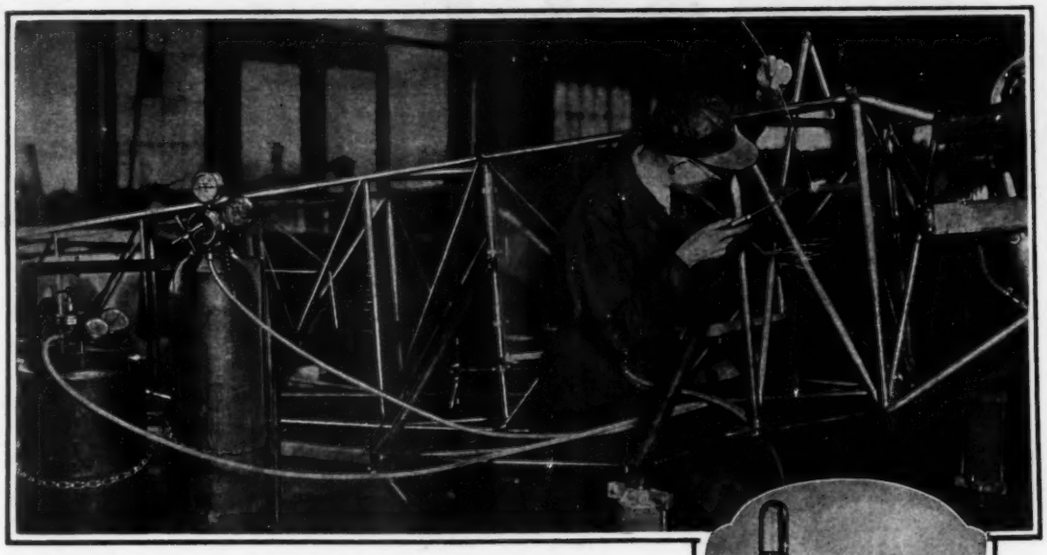
Made in Germany. We are sole distributors for North America.

COMMAND-AIRE, Inc.
Manufacturers of COMMAND-AIRE Airplanes
Little Rock



A—Tank
B—Valve Container
C—Electric Clamps
D—Release Shell
E—Fuses
F—Sprinkler Heads
I—Fuse Lines
II—Sprinkler Lines
a—Union Nut
b—Connecting Piece
c—Y Branch Union
1—Union Nut
2—T Pieces
3a and 3b—Nipples
4a and 4b—Double Fuse Arms

DEPENDABILITY...



OF 83 American manufacturers of steel-frame aircraft listed in "Aviation's" latest survey, 80 have standardized on the oxwelded joint.

—An indication of the *reliability* of the oxy-acetylene weld.

The best of everything for

OXWELDING AND CUTTING

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UNION CARBIDE AND CARBON CORPORATION

General Offices UCC *Sales Offices*

30 East 42nd Street, New York, N. Y. in principal cities throughout the country

At the Hub of the Nation's Airways

FIVE MINUTES by motor car from the Kansas City business district is an airport that spreads out invitingly to the aircraft fraternity over its entire 687 acres — the largest body of airport land so closely adjacent to a metropolitan business section in the country. Immediately across the Missouri River, within ten minutes of the postoffice, is another airport of 200 acres.

At the hub of the nation's airways . . . a factor of vital importance to the manufacturers of aircraft and aircraft accessories who seek the most central location for national distribution.

Radiating from Kansas City are the *airways of the nation.* East, west, north, south, southwest, they make winged transportation of mail, passengers and freight a vital connecting link not only with the entire Kansas City territory but with the nation.

The raw material is here . . . the labor, low power and fuel costs . . . *at the hub of the nation's airways!*

A survey that tells the truth about the opportunities for your industry in this market has been prepared. It will be sent to you confidentially, as well as "The Booklet of Kansas City Facts."

Not just a city but an empire

Kansas City advertising does not confine itself to corporate limits. Within the territory are raw materials and manufacturing advantages of a highly diversified nature . . . many within the city itself, many in the smaller cities of this rich area. Kansas City undertakes to tell the story of the *entire territory* to interested manufacturers, realizing that the city prospers only as its outlying territory prospers.

Opportunity Here Awaits These Products

Men's and Women's Clothing ··· Aircraft and Accessories ··· Hosiery ··· Dairy Machinery ··· Steam Fitting and Heating Apparatus ··· Furniture ··· Porcelain Ware Perfumery and Cosmetics ··· Millinery ··· Wallboard ··· Insulated Wire and Cable ··· Moulding of Bakelite ··· Radio Equipment

Chamber of Commerce of

KANSAS CITY

Kansas City, Mo.

Industrial Committee, Room
Chamber of Commerce, Kansas City, Mo.

Please send me, without obligation, "The Book of Kansas City Facts."

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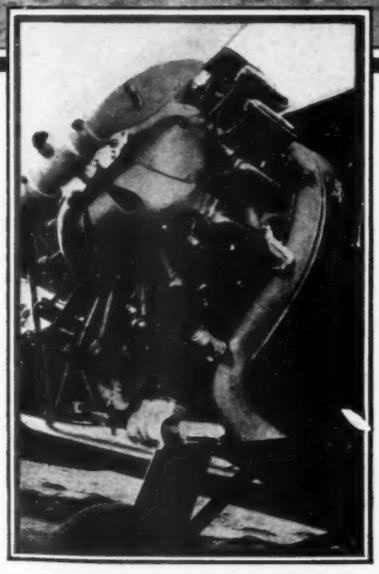
Now Used on 9 Air Mail Lines

the PITCAIRN SUPER-MAILWING



Showing the stream-lined exhaust manifold, one of the many unique features of the Pitcairn Super-Mailwing.

Designed primarily for the purpose of carrying mail and express, the new Pitcairn Super-Mailwing is already flying on 9 contract air mail lines. High cruising speed, marked maneuverability and economical maintenance are responsible for its widespread popularity.

For private operation the Pitcairn Super-Mailwing can be furnished with the mail compartment converted into a spacious passenger cockpit with dual control, providing ample room for two passengers and baggage. It thus becomes a sport plane of the highest performance characteristics.

See the Super-Mailwing at the Chicago Aero Show, December 1 to 9, inclusive, or write us for further information.

PITCAIRN AIRCRAFT INC.

LAND TITLE BUILDING PHILADELPHIA

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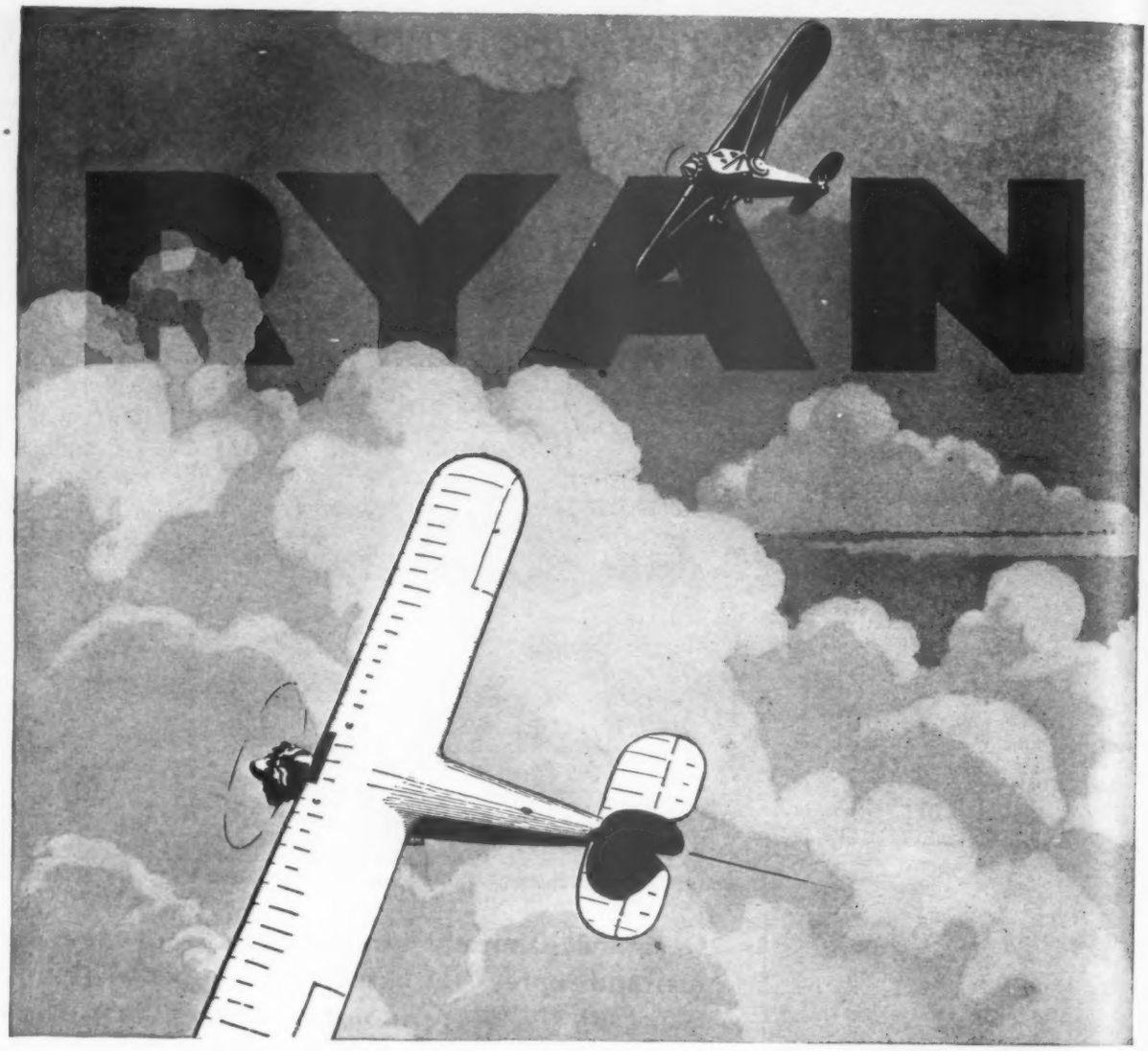
A SISTERSHIP TO THE "SPIRIT OF ST. LOUIS"



A NEW RYAN BROUGHAM FOR SIX

Will be Shown at Chicago!

THIS new addition to the Ryan line is as painstakingly and successfully engineered for the 325 h.p. Wright motor as the five-place Brougham is designed for the Wright Whirlwind power plant. The standard Brougham outperforms all cabin monoplanes of like capacity and power. You can anticipate as great a relative superiority in the larger model, the Ryan Brougham for Six. Its performance is such as you would expect of similar ships with from 400 to 500 h.p. ¶ The five-place Ryan Brougham, the leader in its field, of course is continued. Refinements, but no radical changes, will be noted. ¶ We hope for the pleasure of your presence at our Chicago Show exhibit.

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Massachusetts Airways Corp. *Springfield, Mass.*
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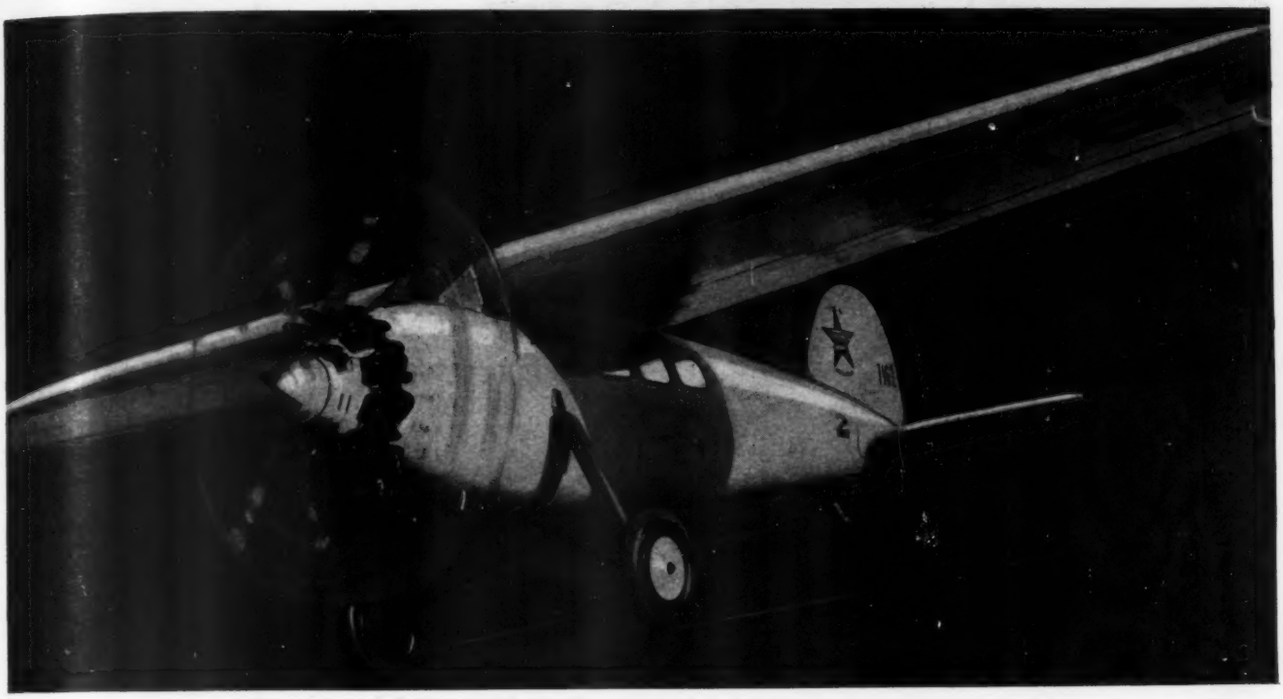
The Ryan Brougham is Approved Type No. 25

THE MAHONEY-RYAN AIRCRAFT CORP'N

Anglum, (St. Louis County) Missouri

AM-13E



Why these famous Lockheed-Vegas *use colorful du Pont finishes*

THEY are a joy to the eye of the modern artist. Each line speaks of the air—of swift, sure flight on tireless wings.

Quality. Beauty. Fittingly the Lockheed engineers specified finishes by du Pont.

The buyer of a ship—for himself or for commercial use—knows that the finishes are scientifically right when he hears the words "du Pont."

But you know better than he: ordinary finishes, perhaps satisfactory enough on the ground, cannot stand the gaff of the air.

For every surface of your plane, du Pont finishes, fabrics and Pyralin have been tested under the severest flying conditions. They mean greater service—durability—maximum prestige and beauty.

Utilize style and color

Prominent manufacturers say: "With du Pont finishing products we can make our ships scintillate with color, take full advantage of the powerful selling appeal of style." Every du Pont color and design is authoritative; fashionably as well as optically correct.

There is no reason why the aircraft maker should not equal the color achievements of the finest automobile manufacturers. The du Pont Color Advisory Service, active both in New York and Paris, is at your command. In solving your finishing problems, call on these experts as well as on the du Pont engineers.

DU PONT
REG. U. S. PAT. OFF.

Air-tested Finishes and Fabrics *that look and perform better*

Du Pont Paints and Varnishes: Du Pont chemists have developed a complete line of paints and varnishes including Dope-proof Paint, water-resistant Spar Varnish and engine finishes.

Du Pont "Wing Dope": The du Pont line of nitrate dopes includes several tested formulas remarkable for build and durability. Impermeable, airproof, hard yet flexible, remarkably resistant to violet rays. Available in a wide variety of highly visible colors.

Fabrikoid: Sturdy Fabrikoid is an ideal material for open cockpit upholstery. Will withstand all weather conditions. "Nemoursa Aeroplane Fabrics" are new type, lightweight materials developed for interior trims of cabin ships. Made on a high-grade woven cotton base and treated with appropriate pyroxylin colors. Embossed in distinctive patterns.

Du Pont Pyralin: A strong, durable, light, unbreakable, transparent material furnished in any gauge from 5-1000 upward in sheets approximately 20" x 50". Ideal for windshields, cabin windows, running lights and other uses.

E. I. DU PONT DE NEMOURS & CO., INC.

Du Pont Viscoloid Co., Inc., 330 Fifth Ave., N. Y. C.
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Fabrikoid Division, Newburgh, N. Y.

MEMBER AERONAUTICAL CHAMBER OF COMMERCE

Suppliers to the United States Government

THANK YOU *for mentioning* AVIATION

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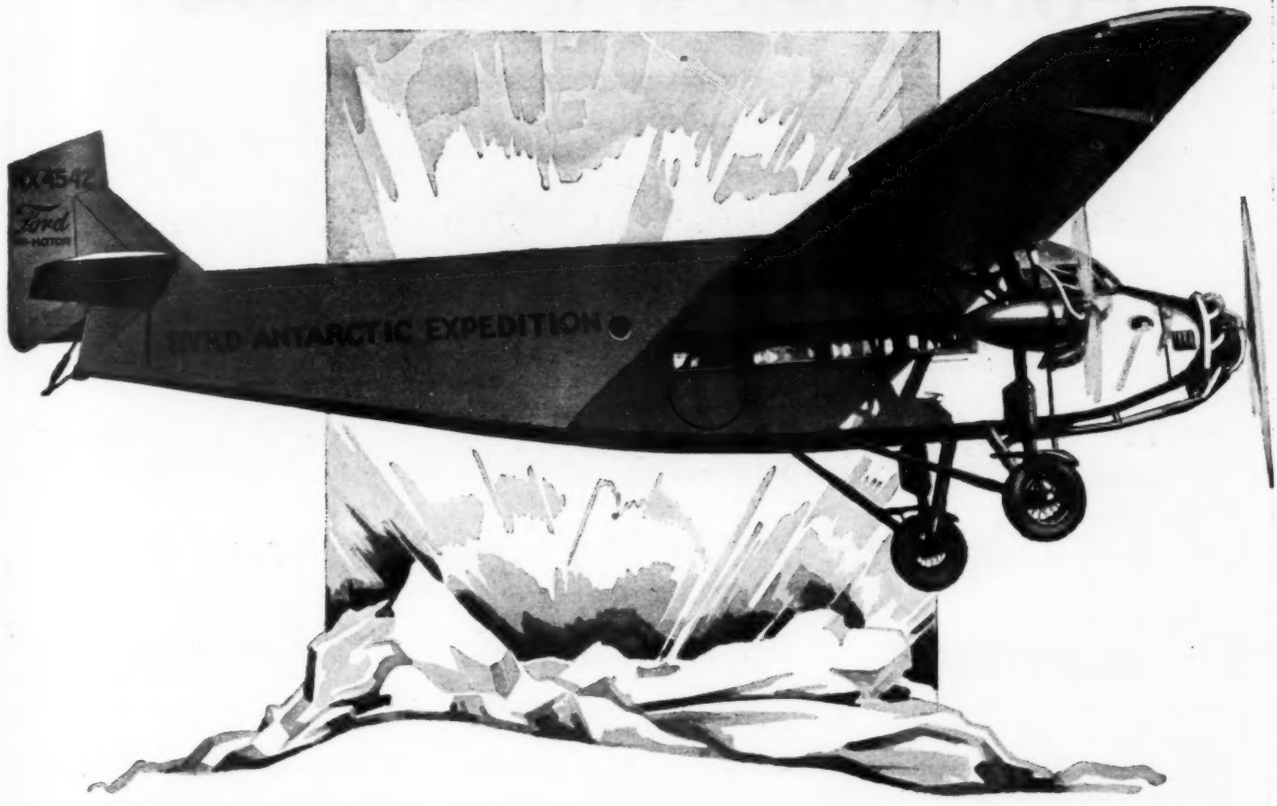

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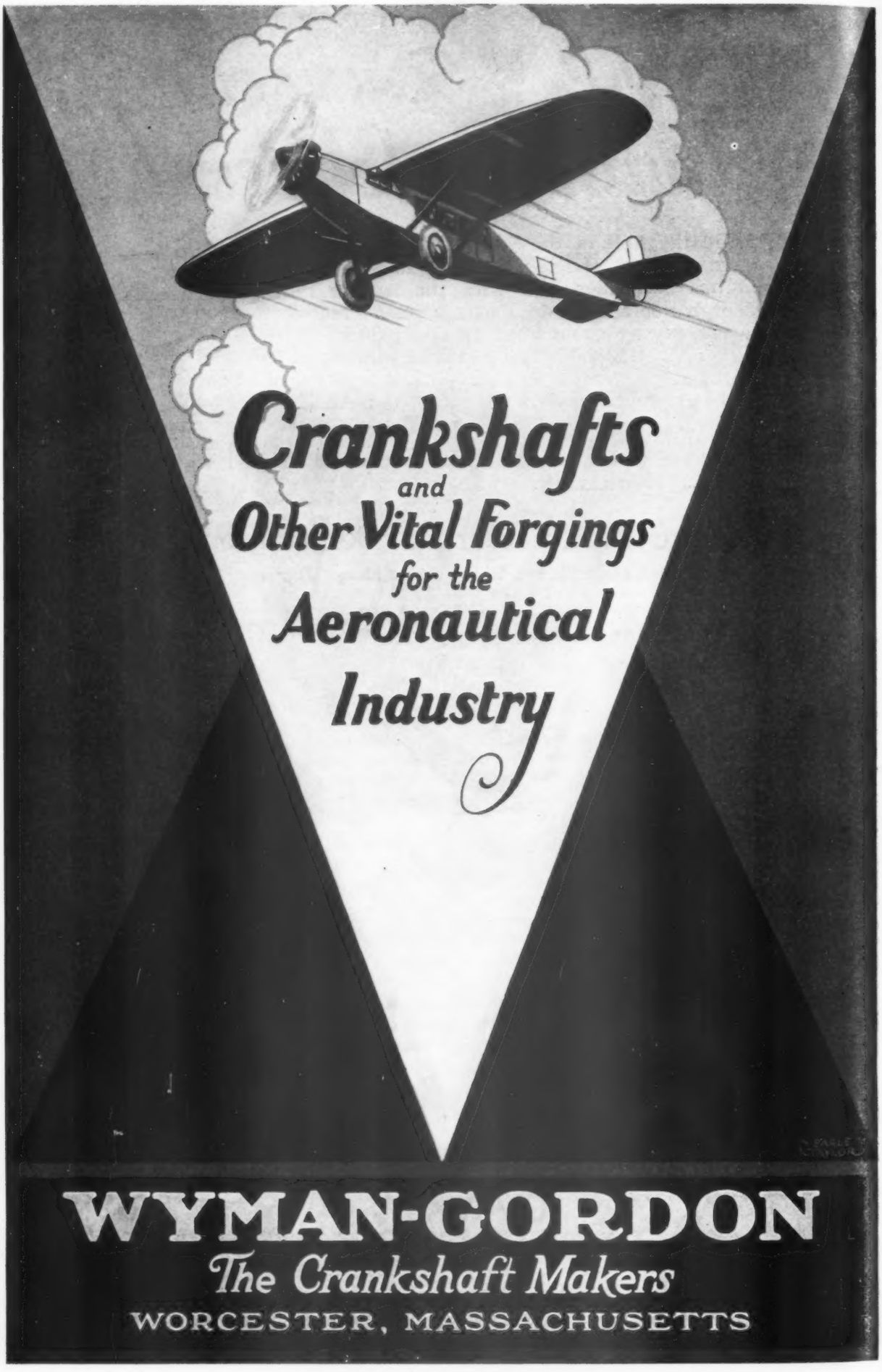

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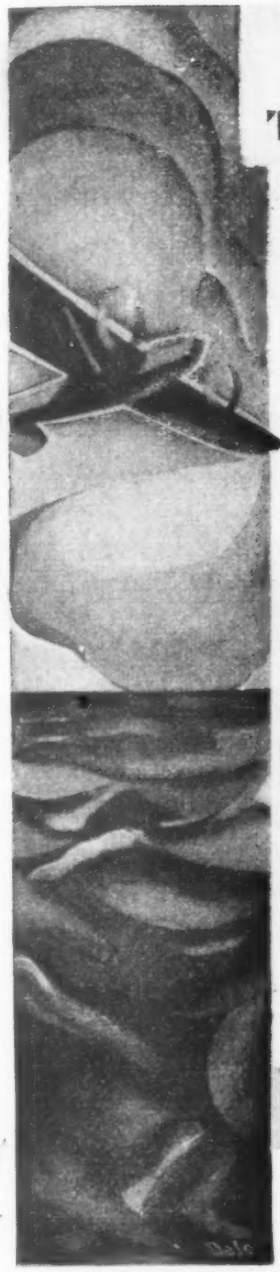

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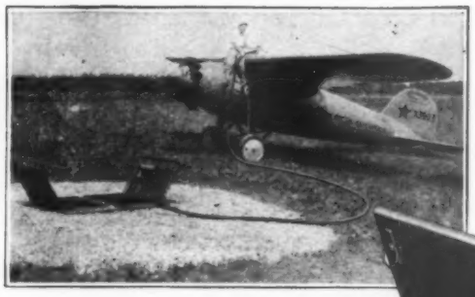

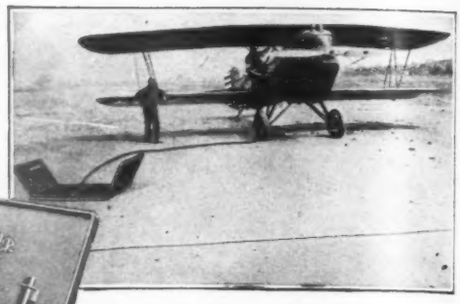

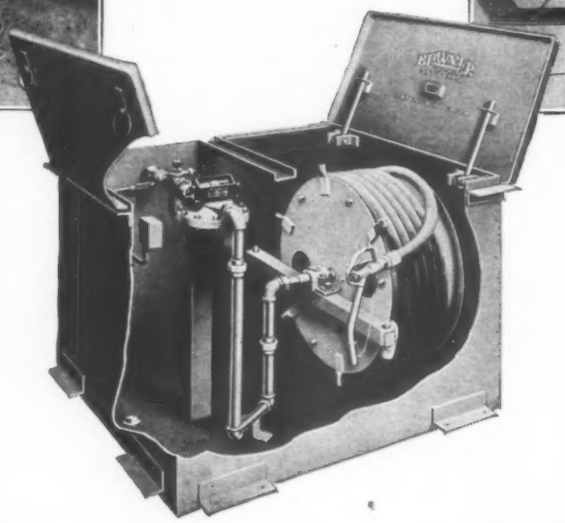

Major Knerr, U. S. Air Service, who recently moved a detachment of bombers across country, says: "The ability to shift a large group of airplanes from one coast to the other depends as much upon the ability of airports *to fuel the airplanes quickly*, as upon the weather and distance."

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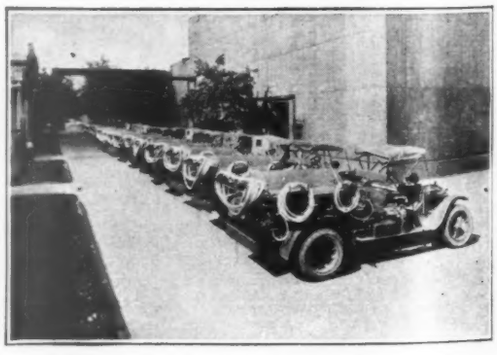

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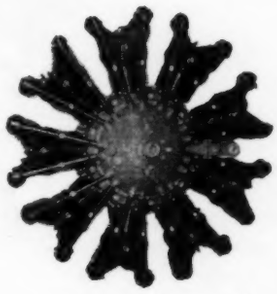

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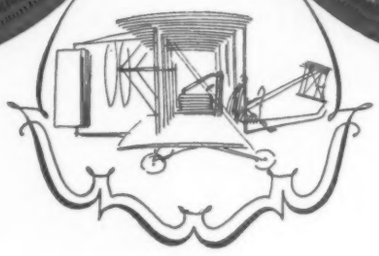

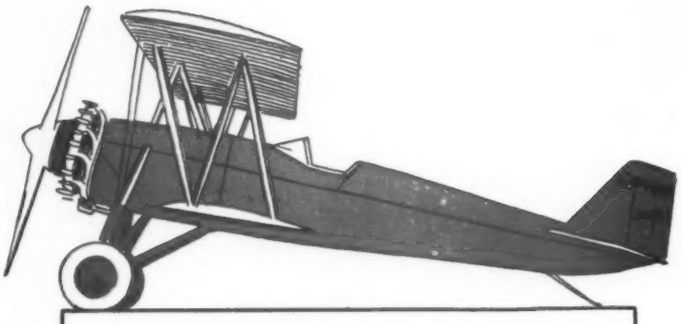

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Vol. XXV DECEMBER 1, 1928 No. 23

The Conquest

A QUARTER of a century has passed since the Wright brothers' airplane left the sands of Kill Devil Hill. It is fitting that we celebrate the event with due ceremony, for it was the fulfillment of a desire which is probably as old as man's conscious thought. This quarter century, during which it has been proved that the Wright brothers had fulfilled the dreams of countless generations, have been marvelous years in all lines of endeavor, but the definite conquest of the air will stand out as the great achievement of the period. Flying has required more courage, more faith and more varied knowledge than any other of our mechanical achievements. The automobile, radio and the movies have all had their great men, but none of them required, or received, such complete cooperation of all known sciences as has been necessary for the development of the airplane.

Airplanes are a synthesis of all branches of physical knowledge. The dream became reality through the contributions of thousands of workers in other fields. The airplane is, from the mechanical standpoint, the finest example of the cooperative efforts of modern civilization, but none of this would have availed without the high courage and steadfast faith which has been shown by the individuals who were willing to give unstintingly of all they had in order that the airplane might be perfected. The airplane is not only the greatest mechanical achievement of the age, but it is a spiritual victory for mankind which has rarely been equalled. This issue is humbly dedicated to the many known and unknown workers who, through their sacrifices, have added such a brilliant chapter to the history of mankind.

The Future

CHICAGO'S great aeronautical show is a cross-section of the industry as it is to-day. There are a great variety of planes from which to choose, and many companies are found to be manufacturing them. There are also an impressive number of engine builders. Exhibitors of accessories are there by the dozen. Airlines and airports are represented and those present will have the opportunity of visioning the status of present day aeronautics. Those reading this issue will also be reminded of the developments of the last twenty-five years, but what we are all most interested in is what will be the development during the next twenty-five years.

Estimates on this all-important subject seem to depend largely on the disposition of the estimator. There are black days when even the most optimistic admit that aircraft have serious and fundamental difficulties to overcome before they obtain the overwhelming successes that are predicted for them; there are days when the sun shines and we believe that what we see and hear at the Chicago Show is just a faint beginning of things to be. Probably both of these states of mind are partly correct. There is no reason to believe that within the next few years the aeronautic industry will rival the automobile industry in the number of units produced; there are still too many difficulties to be overcome. On the other hand, airplanes have proved their value to such an extent that their increased use is almost inevitable. The saturation point of airplanes is probably as far off as the saturation point of automobiles. Every year should show a definite and fairly steady percentage of increase, and this would mean that within a few years the annual increase will surpass our whole present production. This percentage basis of increase will be made possible by detailed improvements in design and in operating facilities. Automobiles are fundamentally the same as they were twenty-five years ago, and the unpredictable increase in their use has been due to better roads and to refinements in design.

Many of the difficulties about flying, which now seem almost insurmountable, will be eliminated by the mere increase in the number of planes. When there are enough planes, every little village will have its landing field. When there are enough planes, detailed weather reports will exist for the whole country. When there are enough planes production costs will be infinitely lower, and when there are enough planes, engineers will learn to build them so that their operation is easier and safer.

It is possible that there will be some radical and revolutionary discovery or invention which will put flying on a new basis, but this is not necessary to insure a fairly large and steady increase in the growth of the business during the next twenty-five years. Improvements in the accessories to flight are just as important as improvements in the planes themselves. More and better airports, better weather reporting, better instruments, especially altimeters and radio dirction finding instruments, will be of enormous value in making flying safer and more practical. As far as planes go they must be made to rise at a great angle and also to descend more steeply and at slower speeds. Engines must be made more reliable and easier to maintain. The cumulative effort of the solution of all these individual problems is hard to imagine, but it will make possible the steady and progressive growth of the aeronautical industry.

In as far as its financial history is concerned aeronautics will probably follow the same course as every other new industry, but the development of its various phases will probably be more rapid. Some few companies will make a success from the beginning, others, while fundamentally sound, will have to be reorganized, while many will go under completely. Throughout all these changes and adjustments there will be a steady forward progress of the industry as a whole, though it is improbable that it will have become really stabilized even by the end of the next twenty-five year period.

Twenty-Five Years of Famous Flights

By R. SIDNEY BOWEN, JR.

AT approximately half past ten o'clock on the morning of Dec. 17, 1903, Orville Wright piloted the famous Wright powered Wright biplane a distance of a little over 120 ft. in 12 sec., at a maximum altitude of 10 ft. and at a speed of slightly over 31 m.p.h. That flight which has gone down in history as man's first successful attempt to stay aloft in a heavier-than-air craft was one of four flights made that historic morning at Kitty Hawk, N. C., the longest of which was made by the late Wilbur Wright for a distance of 852 ft. in 59 sec.

In the quarter of a century that has passed since that memorable occasion the original flight records established by the Wright brothers have been broken and rebroken countless times and the airplane has progressed to the point where it is being used in every day life the world over. Today the records show that an airplane has attained the speed of 318.624 m.p.h.; has been flown nonstop a distance of 4,475 mi.; has remained aloft for 65 hr. 31 min.; and has reached an altitude of 38,474 ft.

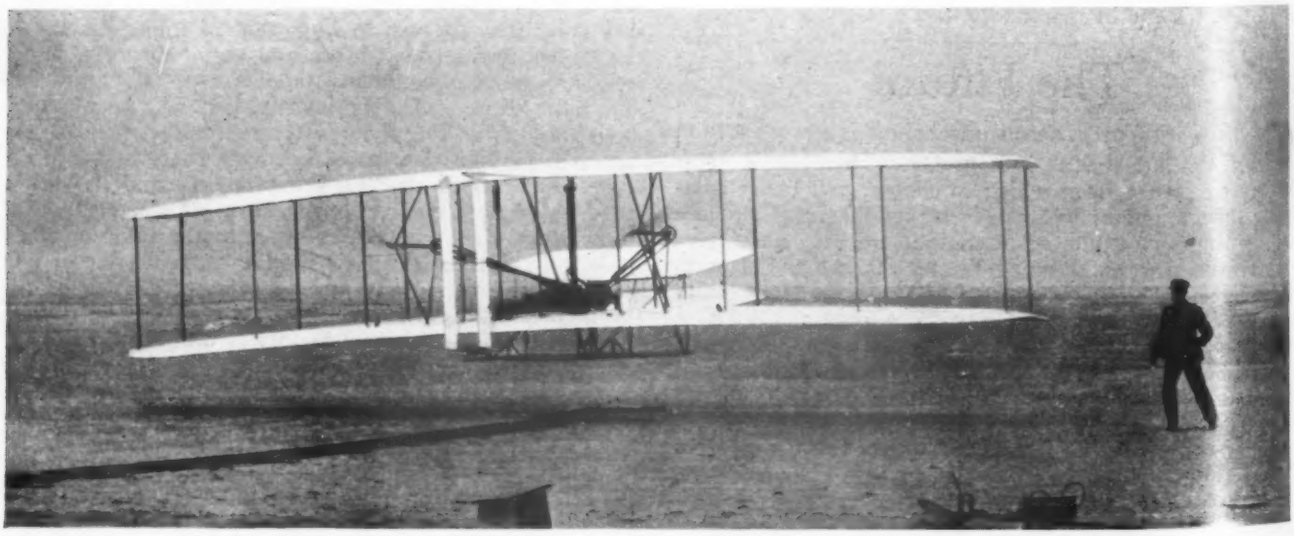
The object of this article is to present year by year, the details relative to famous flights so that one may obtain an idea of the progress made in airplane performance since Dec. 17, 1903.

Following their successful experiments in the latter part of 1903 the Wright brothers returned to Dayton, O., and carried on with their work with a considerable amount of secrecy so that during 1904 very little was known of their progress. However, during that period they made over 100 flights in their machine, and the longest is reported to have been made for a distance of 1,377 ft.

In 1905 the Wrights were still continuing to make progress and on Septemebr 26 of that year a flight of 11 min. in length was made. On September 30 the distance was increased to 12.5 mi.; on October 3 to 15.33 mi.; on October 4 to 20.75 mi.; and on October 5 the longest flight thus far was made—a flight of 24.25 mi. All of the flights were made at a speed of about 38 m.p.h., and without accident. The October 5 flight lasted for 38 min.

Although this article deals with heavier-than-air craft performance, mention should be made at this point of an event that took place at Santa Clara, Calif., on April 29. A glider designed by Prof. John J. Montgomery and piloted by Daniel Maloney was released from a balloon at the height of 4,000 ft. Maloney then performed glides, dives, spirals, figure eights and level flying against the wind. The top speed was estimated at 68 m.p.h. and the distance flown was approximately eight miles in 20 min. A landing was made on a pre-arranged spot and so well executed that the pilot was not even jarred, although he had to land on his feet due to the absence of a special landing gear. The flight is regarded as one of the greatest sirfgle advances in the history of flying.

In 1906 the attention of those aeronautically inclined was attracted to France where Santos Dumont, a Brazilian by birth but a long resident of Paris, was performing with his Biplane No. 1. On October 23 he made the first



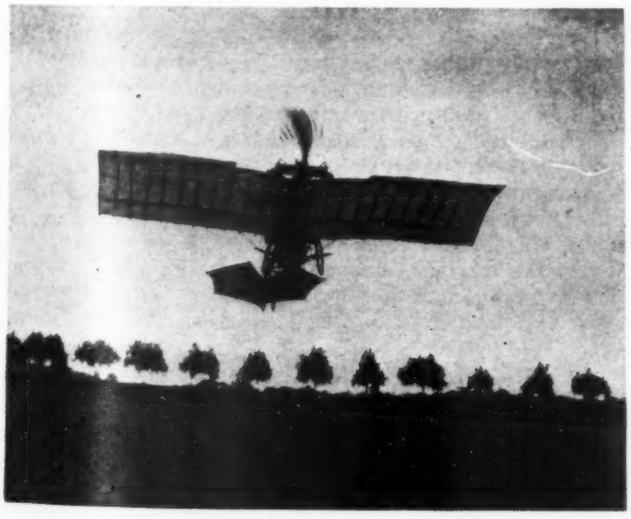
Orville Wright making his historic flight at Kitty Hawk, N. C., Dec. 17, 1903. Wilbur Wright is seen at the right of the picture.

officially observed flight recorded by the Aero Club of France. By flying a distance of 164 ft. Dumont thereby won the Archdeacon Cup previously offered by Ernest Archdeacon who did much to encourage aeronautics in the early days. The flight was made at Bagatelle, France, and on the thirteenth day of the following month Dumont made three more successful flights for distances of 197 ft., 271 ft. and 722 ft. respectively. During the last of these Dumont remained aloft for 21.50 sec. It is to be noted that this performance in 1906 did not equal the Wright performance in 1903.

During 1907 attention continued to center on French activities. Henri Farman, Louis Bleriot Leon Delagrange, Robert E. Pelterie and Santos Dumont were all successful in getting their planes off the ground and remaining aloft for various periods of time. Between April 5 and December 6 Louis Bleriot made eight flights in his Bleriot monoplane, the first being about 100 ft. in length and the longest being 1,978 ft. in length. On his last flight Bleriot made his first turn.

On October 26 Farman made his first turn while in flight. At the time he was flying a Voisin for a distance of 2,530 ft. at Issy. His first flight was made on October 15 when he flew 935 ft. He also made two other flights . . . 1,191 ft. and 1,322 ft. . . . during the month. The longest flight made by Delagrange during 1907 was for a distance of 656 ft.; the longest made by Pelterie was 492 ft. in length; and Dumont's record for the year was a flight of 652 ft.

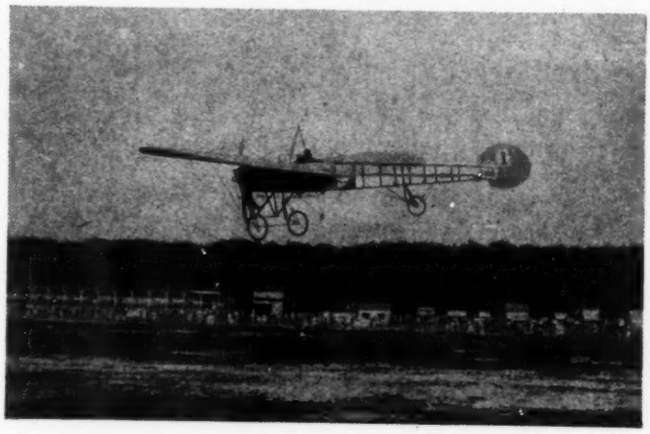
The year of 1908 is regarded as the real starting point in modern advance, and was to pre-war flying what the year of 1927 was to post-war flying. The first event of importance took place on January 13 when Henri Farman won the Grand Prix d'Aviation of 50,000 francs at Issy, France, by making the first officially observed circular flight. Farman piloted his Voisin plane one kilometer in a closed circuit. He also made other flights during the year, and his longest flight was for a distance of 25.474 mi. He also succeeded in remaining in the air for 44 min. 32 sec. during a flight 24.854 mi. in length.



An action picture of Santos Dumont going aloft in his monoplane "Demoiselle" with a 17 ft. wing span.

On June 8, A. V. Roe made the first English flight at Brooklands in a tri-plane of his own design and construction. The plane was powered with a 24 hp. Antoinette engine and Roe piloted it about 75 ft. at a height of two feet.

Up to this time the Wright brothers had confined their experiments to flights over American territory but with the coming of summer in 1908 Wilbur Wright took one of his planes to France and set up camp near Le Mans and proceeded to assemble the plane and demonstrate American aeronautical ability. On August 8 he made his first French flight which lasted 1 min. 47 sec. and was 1.25 mi. in length. From then on he continued to make several flights under contract, but it was obvious that his best time aloft . . . 20 min. on September 5 at Auvours . . . did not indicate the complete performance of the plane, when, on September 9, news was received that Orville Wright had stayed aloft at Ft. Meyer, Va., for 1 hr. 2 min. 30 sec. It was altogether fitting that the "over-an-hour" duration record be made in an American plane while flying over American ground. On September 12 Orville Wright increased the record to 1 hr. 15 min. 20 sec. The hour record having been made over American territory, Wilbur Wright took his plane up on September 21 and flew nearly 61 mi. in 1 hr. 31 min. 25.60 sec. He continued to make many more flights in Europe, some of them with passengers, and on December 18 he stayed up 1 hr. 53 min. 59.50 sec. and won the first Michelin prize of £600.



Louis Bleriot, first man to fly the English Channel, in his Bleriot monoplane No. I.

Another notable flight of 1908 was made of July 4 by Glenn H. Curtiss who piloted his "June Bug" at a speed of 39 m.p.h. at Hammondsport, N. Y., and won the Scientific American trophy. Four days later, according to the records, the first woman to fly, Mme. Therese Peltier, went up with Delagrange in a Voisin at Turin, Italy. The second best all-European flight of the year was made by Leon Delagrange on September 5 at Issy, France, when he flew his Voisin 15.364 mi. in 29 min. 53.80 sec.

The final event of prominence for the year of 1908 occurred on December 31 when Wilbur Wright went up at Auvours, France and flew 90 mi. in 2 hr. 20 min. 23 sec. It is stated in the records that only 76.5 mi. of this flight were counted as official. An interesting item of note in connection with Wilbur Wright's flights in France, is that between August 8 and October 10 he spent 13 hr. 49 min. in the air and carried 13 persons a distance of 431 mi. without a single accident.

Although it cannot be placed under the heading of famous flights, an item of interest in connection with the year of 1909 is that on January 9 the Aero Club of France issued the first pilot's certificates. These certificates were issued to Leon Delagrange, Santos Dumont, R. Esnault Pelterie, Henri Farman, Wilbur Wright, Orville Wright, Captain Ferber, and Louis Bleriot.

The first aerial event of importance took place on April 8 when Santos Dumont flew his 17 ft. monoplane "Demoiselle," cross-country for a distance of 2.5 km.

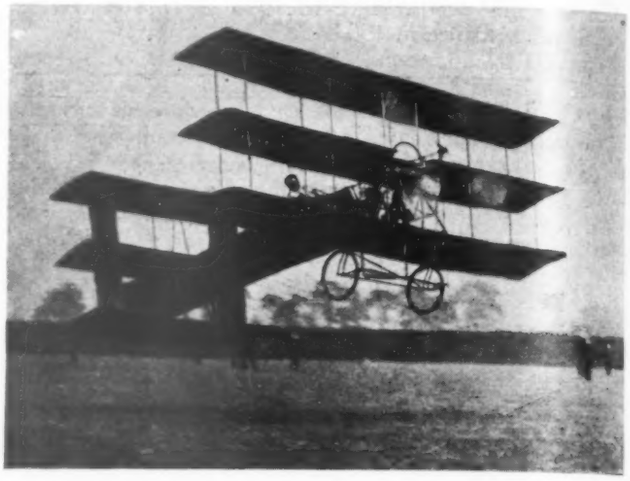
The next flight of note that was made that year was one which has gone down in aeronautical history as one of the greatest aerial achievements ever accomplished. On July 25, Louis Bleriot took his monoplane off the ground at Calais, France, and about 40 min. later landed it on Northfall Meadow behind Dover Castle, England. Thus for the first time in the history of the world England and the Continent were connected by air. The airline distance between the two points of that great flight is about 25 mi., and, according to the records, Louis Bleriot maintained a speed of about 45 m.p.h. Prior to the Channel flight Bleriot had made a 25 mi. non-stop flight between Etampes and Orleans. As has happened on more than one over water flight attempted since that date, Bleriot lost his bearings and did not land where he intended to land. Thus it happened that the "crowd" that witnessed the completion of one of the most famous flights in history consisted of one English constable. In making the Channel flight Louis Bleriot won the London Daily Mail prize of £1,000.

Curtiss Wins Gordon Bennett Race

During the later part of August the leading airmen of the world gathered together at Rheims, France, to take part in the aerial events that made up the program for the Rheims Aviation Week. The main event was the Gordon Bennett Trophy race, which, according to the records was open to all types of heavier-than-air craft. This event was won for America by Glenn H. Curtiss who flew his Curtiss Biplane over the 20 km. course at a top speed of 43 m.p.h. Mr. Curtiss had made several successful flights during the early part of the year at Hammondsport, N.Y., and Mineola, L.I., N.Y In addition to winning the Gordon Bennett Trophy race Curtiss also flew his Curtiss Biplane to first place in the 30 km. event.

On October 18 Count de Lambert took his Wright biplane off the ground at Juvisy, France, and proceeded to astonish the aeronautical world by flying over the city of Paris and making a complete circle of the Eiffel Tower. The feat was considered at the time to be one of great importance, and undoubtedly it can be recorded as the first violation of the present "flying over conjested area" ruling.

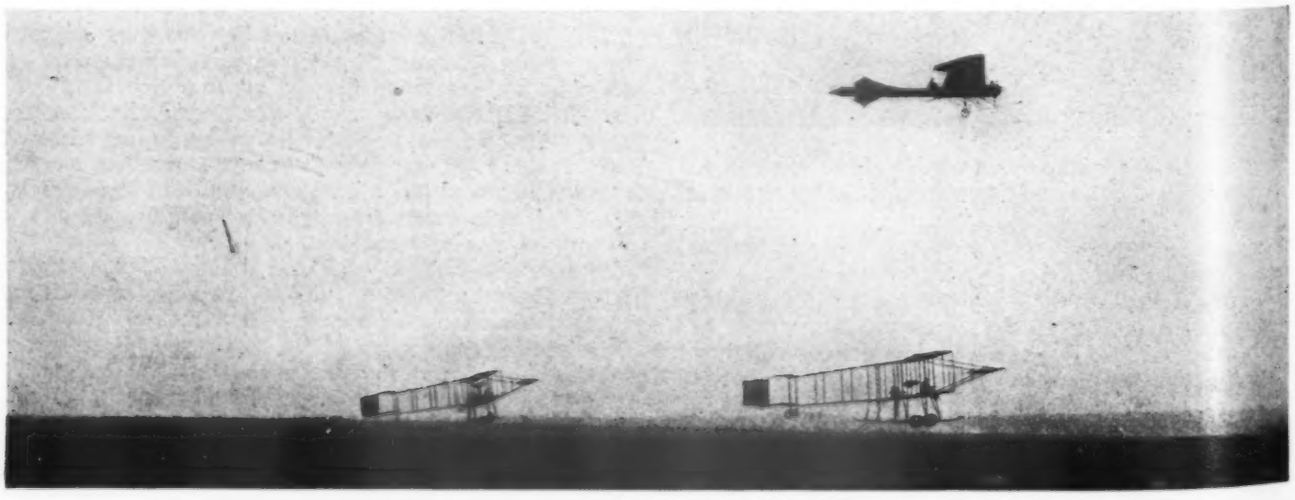
Among the other famous flights made during the year of 1909 was the winning of the London Daily Mail prize of £1,000 by J. T. C. Moore-Brabazon when he succeeded in completing a circular mile flight with an all-British plane over British territory. Another aerial achievement was the circling of the Statue of Liberty by Wilbur Wright in a Wright Biplane, and still another, the circling of Governors Island by Glenn Curtiss in his Curtiss Biplane. It is also recorded that on October 2, Orville Wright reached a height of 1,637 ft. at Berlin, Germany. The last flight of any importance in 1909 was the winning of the Michelin Cup and the establishing of a world's cross-country record by Henri Farman on November 3 when he piloted his Farman biplane a distance of 144 mi. in 4 hr. 17 min. 53.40 sec.



A. V. Roe getting off in his Avro Triplane at Lea Marshes, England, 1909.

The first flight to win world praise in 1910 was made on April 27 and 28. Paulhan, a young Frenchman, who had "won his wings" in France but a short time before, successfully piloted his Farman Biplane from London to Manchester, England, with an over-night stop at Lichfeld. This distance flown was 186 mi. and the total flying time was 4 hr. 11 min. By making the flight Paulhan won the £10,000 prize offered by the London Daily Mail. The famous English airman, Claude Grahame White, attempted the flight also but was forced down for various reasons and before he could get under way for the last effort, Paulhan had completed the flight.

On May 21 Jacques de Lesseps made the second crossing of the English Channel by air. He piloted a Bleriot powered with a Gnome rotary engine from Calais to Dover, a distance of 37 mi. in 42 min. Another famous



Left to right, Sommer, Farman and Latham in the air at the Harvard-Boston Aero Meet, Aug. 27, 1911.

over-water flight was made in America eight days later when Glenn Curtiss flew his Curtiss Biplane from Albany to New York City, with one stop en route. The airline distance is 150 mi. and Curtiss' flying time was 2 hr. 32 min. at an average speed of 54 m.p.h. Another aerial feat accomplished by Curtiss was a successful landing on the waters of Lake Keuka, at Hammondsport, N. Y., during the early part of June.

It would seem that over-water flying was the favorite sport during the first six months of 1910 for on June 2, C. S. Rolls flew a French built Wright biplane from the English coast to the French coast, and returned to England without making a landing on French soil. The time of the flight is recorded as being a little over 1 hr. 30 min.

The existing altitude record went by the board during the first few days of August when George Chavez took a Farman biplane aloft in Scotland and succeeded in reaching an altitude of 5,887 ft. During the same month the Frenchman, Leblanc won what is believed to have been the first aerial tour ever organized. It was known as the Circuit de l'Est and was conducted by the French newspaper, Le Matin. Leblanc piloted a Gnome powered Bleriot over the 500 mi. route in a total flying time of 12 hr. 1 min. 1 sec. Another French pilot by the name of Aubrun won second place in a Bleriot with a total flying time of 13 hr. 31 min. 9 sec. Leblanc and Aubrun were the only two of eight starters to complete the tour.

First Paris-London Attempt

The first attempt to fly from Paris to London was begun on August 16, when J. B. Moissant and a mechanic took off in a French plane. Forced landings from one hundred and one different troubles delayed the progress of the flight so much that it was exactly three weeks to a day before Moissant landed at London.

In the Fall of 1910 Claude Grahame White won the Gordon Bennett Cup for England. He also won the Boston Globe prize when he made the Squantum, Mass., to Boston Light and return flight in 34 min. 1.40 sec. Two flights of prominence were made in Europe during this period. On September 11 Robert Loraine, an Englishman attempted to fly the Irish Channel. When he was forced to land in the water he was but a few yards from the shores of Ireland. The other flight was made by George Chavez on September 23 when he piloted his Farman biplane across the Alps at Dondo and made a successful landing in Italy.

December saw the setting of a new world's altitude record when on the twenty-sixth day the American pilot, A. Hoxey went up to 11,474 ft. at San Francisco, Calif. On the thirtieth day of that month Labuteau, a French pilot, set a distance record when he won the French Michelin Cup by piloting his Farman plane 365 mi. in 7 hr. 48 min. at Buc, France. On the last day of the month S. F. Cody won the British Michelin Cup at Laffin's Plain, England, with a flight of 185 mi. 787 yd. A short time before Cody landed T. O. M. Sopwith set his plane on the ground after a flight of 150 mi.

For quite some time the London Daily Mail had been dangling a prize of £10,000 before the eyes of aspiring airmen. To gain the prize one had to make an airplane flight around Briton's borders. In the spring of 1911 the much sought for prize was won by Lieutenant Conneau who completed the circular flight some distance ahead of Vedrines. Both pilots were Frenchmen. Four pilots competed for the prize, the other two being S. F. Cody and J. Valentine, both of whom completed the flight but did not "place in the money."

At about the same time as the "Round Briton" race was being held there was accomplished in America a flight which was the first of its kind, and which might be considered as the initial step in the establishment of what is today recognized as the greatest aerial service in the entire world . . . the United States Air Mail. A Curtiss plane, piloted by a man whose name is not mentioned in the records available, took off from the Nassau Boulevard Airdome, Long Island, N. Y. The passenger in the plane was the Hon. Frank H. Hitchcock, postmaster general, and on his knees he carried a bag of mail. When

Glenn Curtiss up at Sheepshead Bay, Long Island, N. Y., in 1910.

the plane passed over Mineola, L. I., the Postmaster General threw the mail bag over-board and thus made the first air mail delivery in the history of flying.

Another aerial "stunt" performed in 1911 was executed on January 18 when Eugene Ely successfully took off from the deck of the U.S.S. Pennsylvania in San Francisco Harbor. The feat has been duplicated by countless pilots since that date, but, according to many sources of information, Ely was the first airman to perform the stunt successfully. On February 11 Glenn Curtiss successfully flew from land to water and from water to land. The flight was made at San Diego, Calif.

Although several pilots had tried, it was left to M. Prier, a French pilot to make the first non-stop airplane flight between London and Paris. On April 12, Prier took off from London, and in 3 hr. 56 min. he had flown the 250 mi. stretch and made a successful landing at Paris.

July 11 was the day on which a famous flight was made by Harry N. Atwood, known at that time as "The King of Air." Piloting a Burgess-Wright biplane, Atwood made a 461 mi. flight between Boston and Washington with eight stops en route. Three days later he took off

again in his plane and landed on the grounds of the White House and called on the President. Another great flight made by Atwood was completed on August 26 of that year when he landed safely at New York after a four day, 21 stop, 1,155 mi. flight from St. Louis, Mo. In making this flight Atwood won the Victor Evans prize of $10,000 and established a new world's cross country record.

All of the famous flights of 1911 were not made by American pilots. On August 27 Henri Farman won the Champagne prize of $10,000 when he flew 112.50 mi. in 3 hr. 4 min. 56 sec. The flight was made during the Harvard-Boston Aero Meet, and a few days before, T. O. M. Sopwith won the Boston Light race in 31 min. 33 sec., beating Grahame White's best time for the course by over two minutes.

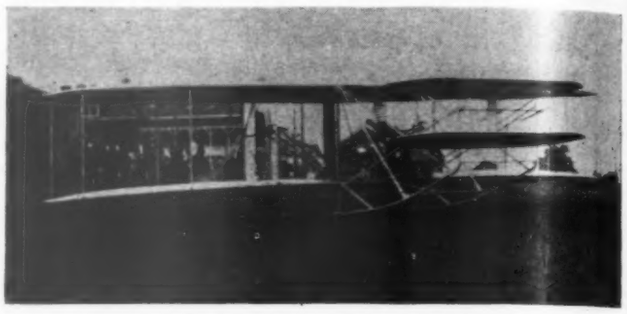
Another stunt that must be added to the 1911 list was performed by the famous acrobatic flier, Lincoln Beachey. On June 28 Beachey succeeded in flying over Niagara Falls, under the suspension bridge that connects the United States with Canada, and right on down the Gorge. That stunt, without question, was the most dangerous one performed during the year.

The winner of the 1911 Gordon Bennett Cup event was C. T. Weyman who piloted his Nieuport monoplane over the course at an average speed of 80 m.p.h. The final important flight of the year was completed on November 5 when Calbraith P. Rodger landed his Wright biplane at Pasadena, Calif., after a 49 day, 18 stop, aerial voyage from New York City. That flight was the first trans-continental crossing by air.

The outstanding flights made during 1912 consisted mostly of attempts to better the existing air records. On January 13, the French pilot Vedrines established a speed record of 92 m.p.h. on a military type of Deperdussin. On January 22, Fischer reached an altitude of 4,593 ft. in a military Farman biplane carrying two passengers. And on the same day Maurice Prevost established a world's altitude record when he piloted a military Deperdussin to a height of 2,200 meters carrying three passengers.

The second transcontinental flight was completed on February 8 when Robert G. Fowler landed at Jacksonville, Fla., after a 51 day trip from San Francisco. It will be noted that Fowler's time for the first west-east flight across the continent was two days longer than Rodger's time for the first east-west transcontinental flight which was completed November 5, 1911.

The records show that on November 22 a French pilot by the name of Rugere made successful flights with a seven passenger hydroairplane at Issy, France. The plane was designed by Gabriel Voisin and was powered with a 200 hp. Clerget engine. They also show that the matter of record breaking in 1912 was not confined entirely to the "sterner sex." On November 21 a Russian aviatrix, Miss Galatschikoff, took a Fokker monoplane up to 2,400 meters to establish a women's altitude record. The flight was made at the Johannisthal Aerodrome located near



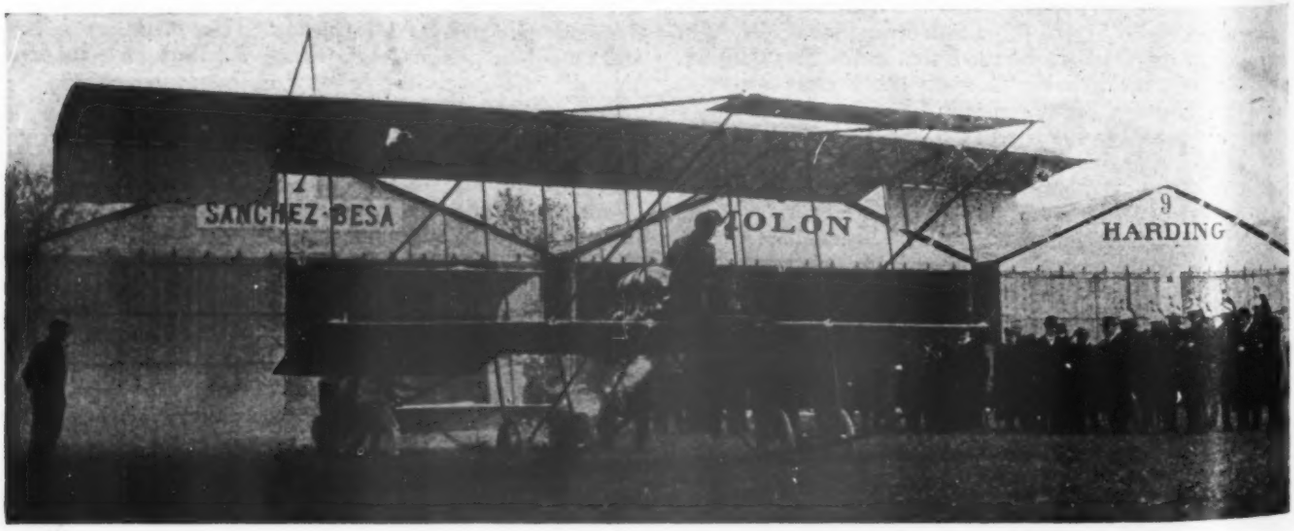
Orville Wright getting off at Ft. Meyer, Va., Sept. 12, 1908.

Berlin, Germany. Perhaps the Russian lady's flight served as an inspiration to male pilots, for on December 11, Roland Garros reached a world record altitude of 19,032 ft. at Tunis. Garros set his new altitude record with a Morane-Saulnier monoplane.

The premier racing event of the year . . . the Gordon Bennett Cup race . . . was won on December 12 by Jules Vedrines who flew his Deperdussin plane over the 20 km. course at Clearing Aerodrome, Chicago, Ill., in 6 min. 55.95 sec. The plane was powered with a 140 hp. Gnome engine.

The first flight made in 1913 that attracted the attention of the then airminded of the world was a 500 km. trip from Pau, France, to Madrid Spain, made on January 24 by Oscar Bider, a Swiss pilot. Bider crossed the Pyrenees at their widest point which necessitated a flight of 120 km. over the mountains. The next event of importance was a 1 hr. 10 min. 17 sec. flight made on February 10 in an Aviatik biplane carrying five passengers and pilot. The pilot was A. Faller; the plane was powered with a 100 hp. Argus engine and the flight was made in Germany.

The world's altitude record came in for some attention



Paulham, winner of the** 180 **mi. London-Manchester, England, flight ready to take off in his Farman Biplane.

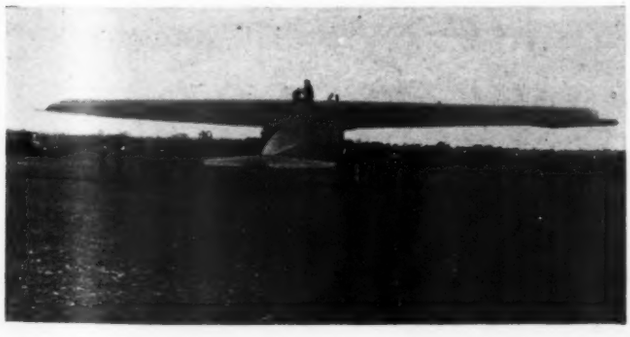
on March 11, when the French pilot Perreyon took a Bleriot monoplane up to 19,685 ft. And on April 16 the first Jacques Schneider Maritime Aviation Cup race was flown at Monte Carlo. Maurice Prevost won the event in a Deperdussin hydroairplane powered with a 160 hp. Gnome engine. Prevost's average speed over the 150 nautical mile course was only 45.5 m.p.h This is explained by the fact that he was forced down before he reached the finish line and taxied across, and was made to go back to the landing point and fly across.

Another passenger carrying record was established at Chartres, France, during the month of March when J. Frantz stayed aloft for 11 min. 48.40 sec. with eight passengers in a Savary biplane powered with a 110 hp. Salmson engine. And another cross-country record went by the board during the month of June when Brindejonc flew a Morane-Saulnier monoplane from Paris to Warsaw with a stop at Berlin in the total time of 11 hr. The distance covered on the flight was 933 mi.

On September 1 the French pilot Pegoud startled the aeronautical world by executing the first voluntary loop-the-loop in a Bleriot monoplane at Juvisy. In view of the fact that the records term Pegoud's great feat of acrobatics as the first voluntary loop, it is to be assumed that innumerable involuntary loops had been made up to that time.

The 1913 Gordon Bennet Cup race was held in France on September 29, and was won by Maurice Prevost who piloted his 160 hp. Deperdussin monoplane to first place with an average speed of 105 m.p.h. The final event of the year that was of noteworthy importance was the first flight over the Pyramids of Ghizeh made by Marc Pourpe in a Morane-Saulnier monoplane on December 17.

In the year of 1914 there were only four aerial achievements of any importance prior to the outbreak of the World War. The first took place on February 8 when the German pilot, Karl Ingold established a world's duration record by staying aloft for 16 hr. 20 min. Ingold took off at 7:35 A. M. and flew 1,750 km. before he landed at 11:35 P. M. The last five hours of the flight



The Army T2 Fokker in which Lieutenants Macready and Kelly crossed the continent non-stop.

were made in total darkness. This record did not stand for long however, for on May 2 the French pilot Poulet flew a 60 hp. French biplane between Etampes and Orleans for 16 hr. 28 min. 56.80 sec. The distance reported to have been flown by Poulet during that time was 936.80 km.

America's participation in record breaking during the early months of 1914 consisted of a flight by Lieut. T. F. Dodd with a passenger from San Diego to a point four miles north of Burbank, Calif., in 4 hr. 43 min. The airline distance is 244.18 mi. and the flight established an America cross-country (with passenger) record. The one racing event of the year was the second Jacques Schneider Maritime Aviation Cup race held on the Bay of Monaco. This 150 nautical mile speed contest was won by an Englishman, C. Howard Pixton, who piloted his 100 hp. Gnome powered Sopwith hydroairplane to first place with an average speed of 86.8 m.p.h.

Then came the World War. To try to record the outstanding airplane flights made during that four year period would be to attempt the impossible, for each flight was made for strictly military reasons, and no thought was given to the establishing of flight records. Therefore, for the purpose of this article we will omit details regarding the many and varied flights, and merely set down in type the surnames of some of the most famous pilots who made the flights during the World War. They are: Mannock,

Flight picture of Alan Cobham near the end of his 16,000 mi. London-Capetown-London flight.

Ball, Bishop, McCudden, Rickenbacker, Lufbery, Putnam, Luke, Fonk, Guynemer, Nungesser, Baracca, Barachine, Von Richthofen, Udet, and Immelmann. As regards airplane performance progress made during the period of the World War one might compare the feats of 1913 with those of 1919, which will be recorded next. However, it should be remembered that all aeronautical progress made during 1914-15-16-17-18 was made with the military point of view in mind.

The first aerial feature of the year of 1919 was the setting of a world's altitude (with passenger) record by Captain Lang R.A.F. who reached an altitude of 30,500 ft. over England on January 2. On February 12, Lieut. B. W. Maynard established a new kind of airplane record by looping a Sopwith "Camel" 318 times at Romorantin, France. The next record to go by the board was the American speed record, when, on February 21, a Thomas-Morse Scout powered with a 300 hp. Hispano-Suiza engine was piloted 164 m.p.h at Ithaca, N. Y.

On May 16 there began the first successful crossing of the Atlantic ocean by a heavier-than-air craft. On that day the Navy flyingboat NC-4 commanded by Lieut. Comdr. Albert C. Read took off from the water at Trepassey, N. F. and headed for Horta, Azores. From the Azores the refueled plane headed for Portugal, Spain, and from there by easy stages to Plymouth, England where it arrived on May 31. The original start of the NC-4 flight was made from Rockaway L. I., on May 8. From there the plane proceeded to Cape Cod, Mass., to Halifax and on to Trepassey. The airline distance of the Trepassey-Plymouth flight is 4,791 mi. and the total flying time from Rockaway to Plymouth was 53 hr. 58 min.

During the following month the greatest airplane over-water flight in the history of the world up to that time was accomplished. A Vickers-Vimy-Rolls biplane powered with two Rolls Royce 400 hp. "Eagle" VIII engines, and piloted by Capt. John Alcock and Lieut. Arthur W. Brown made a non-stop flight from St. John's N. F. to Clifden on the Irish Coast. The airline distance between those two points is 1,900 mi. and the flight was made in 15 hr. 57 min.

The next famous flight, also a long distance affair, was

made between July 24 and November 9. Under the command of Lieut. Col. R. S. Hartz, as pilot, E. E. Harmon as assistant pilot, and S. J. Harding and J. Dobias as mechanics, a twin engined (400 hp. Liberty) Martin Bomber was flown "Round the Rim" of the United States. The flight, which was made for a distance of 9,823 mi., was the longest ever attempted by the Air Service up to that time, and was completed in 114 hr. 45 min. actual flying time.

While the Round the Rim flight was in progress the world's altitude record was broken by an American pilot flying an American plane. The pilot was Roland Rohlfs and the plane used was a Curtiss Wasp Triplane powered with a Curtiss K-12 400 hp. engine. On September 18, Rohls took the plane up to 34,910 ft. However, calibration of the barograph by the Bureau of Standards showed a minimum corrected altitude of 32,450 ft. That figure stood as the world's altitude record.

A looping record having been established, pilots on both sides of the Atlantic made various attempts to raise the total number of loops. The most successful attempt of the year was made on October 28 when the French pilot Alfred Flamval looped a French military plane 624 times in two hours, thereby beating the original record by over 100 per cent.

The last great flight of that year of long distance flights was accomplished between November 12 and December 10. The flight was the longest made thus far and was made from Hounslow Aerodrome, London, to Port Darwin, Australia, with stops enroute, by Capt. Ross Smith in a twin engined (400 hp. Rolls Royce Eagle VII) Vickers Vimy-Rolls biplane. The distance flown by Capt. Ross Smith was 11,500 mi.

The breaking of the world's speed record was the first event of aeronautical importance in 1920. On February 7 the French pilot Sadi Lecointe flew a Nieuport biplane 171.3 m.p.h. at Villacoublay, France. Then came the first long distance flight of the year by two Italian airman, Lieutenants Ferrari and Masiero. Flying an S. V. A. plane they took off at Rome, Italy, on February 14 and headed for Tokio, Japan, 10,379 mi. away. After several stops en route the pair arrived at Tokio on May 31. The plane was the only one of 10 planes competing in the long distance event to successfully reach its intended destination.

Then came America's turn to break a record. On February 26, Maj. R. W. Schroeder took a 400 hp. Liberty Packard Lepere biplane up to a new world's altitude record of 33,114 ft. The flight was made over McCook Field, Dayton, O. On June 21, two French pilots, Boussoutrot and Bernard set a world's endurance record when they stayed aloft in a Farman "Goliath" (two 260 hp. Salmson engines) for 24 hr. 19 min. 7 sec. at Villesawage-La-Marmogue, France.

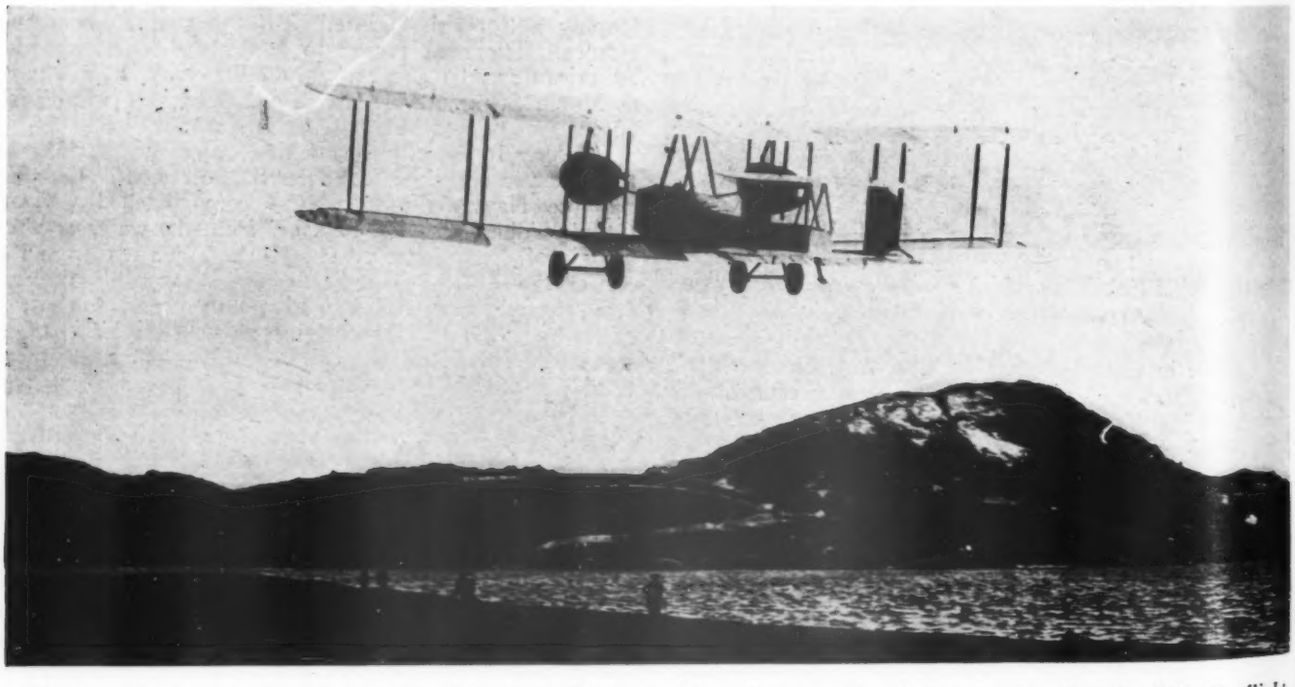
The next event was a 9,000 mi. flight from Mineola, L. I. to Nome, Alaska and return by four DH-4 planes commanded by Capt. St. Clair Street. The flight which was made in a total flying time of 112 hr. and at an average speed of 80 m.p.h. was started on July 15 and completed on October 20.

A Lady Loops 87 Times

The incentive to establish looping records having been provided by the male pilots, Laura Brownvill took up a Curtiss Standard J-1 powered with a Curtiss K-6 150 hp. engine at Curtiss Field L. I. on August 13 and established a world's record for lady loopers by looping her plane a total of 87 times.

The first post-war meeting of high speed seaplanes took place at Venice, Italy on September 18 and 19. This classic event, the Schneider Trophy Contest was won by an Italian pilot, Lieut. Chevalier Luigi Balogna, who flew his Savoia S-19 seaplane powered with a Anseldo engine to first place with an average speed of 107.02 m.p.h. It is interesting to note here that in the course of six years the speed of seaplanes had been increased less than 20 m.p.h. while the speed of land planes had been increased over 60 m.p.h. In other words the fastest speed for a land plane in 1913 was only two miles per hour lower than the fastest time for a seaplane in 1920. This great difference in speed between the land plane and the seaplane does not of course exist today.

The next racing event of the year was the Gordon Ben-



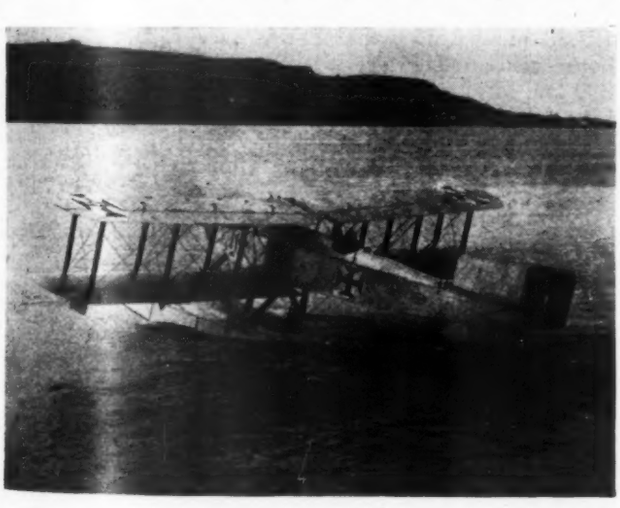
Alcock and Brown en route to Ireland in their Vickers- Vimy-Rolls. The first non-stop North Atlantic flight.

nett Cup race for land planes held at Etampes, France on September 27. The event was won by the French speed merchant Sadi Lecointe who piloted his 300 hp. Hisso Nieuport 29, 187.50 mi. in 1 hr. 6 min. 17.20 sec. at an average speed of 168.26 m.p.h., about three miles per hour less than the world's speed record he had established in February As a matter of fact Lecointe set up a new speed mark on October 10 when he flew his 300 hp. Hisso Nieuport one kilometer in 12.1 sec. at Buc, France. That speed was calculated at 296.694 km.p.h. or about 185 m.p.h The flight broke the record of 181.95 m.p.h. that had been set by Captain De Romanet a few days before.

On November 25 of that year the first Pulitzer Race was held at Mtichel Field, L. I., and was won by Lieut. C. C. Mosley who piloted his 600 hp. Packard Verville over the 132 mi. course in 44 min. 29.57 sec. at an average speed of 178 m.p.h., seven miles per hour below the world's speed record.

The year of 1921 was a little more than four months old when Lieut. J. A. Macready and Roy S. Langhan took a Packard Lepere biplane up to 34,150 ft. and a new world's altitude record at McCook Field, Dayton, O. on May 6. Three months later, August 16 to be exact, David McCulloch piloted a Liberty powered Loening "Air Yacht" to 19,500 ft. with four persons at Port Washington, N. Y., and set a new world's hydroairplane altitude record. The 19,500 ft. mark was reached in exactly 48 min.

The 1921 Schneider Trophy Contest was held at Venice, Italy on August 6 and 7, and was won by the Italian airman De Briganti who piloted his Savoia VII seaplane over the course at an average speed of 111 m.p.h. In view of the fact that the seaplane speed record had been increased, it seemed altogether fitting that the land plane speed mark be raised also. So on September 25, Sadi Lecointe flew his Nieuport 204.6 m.p.h. over a

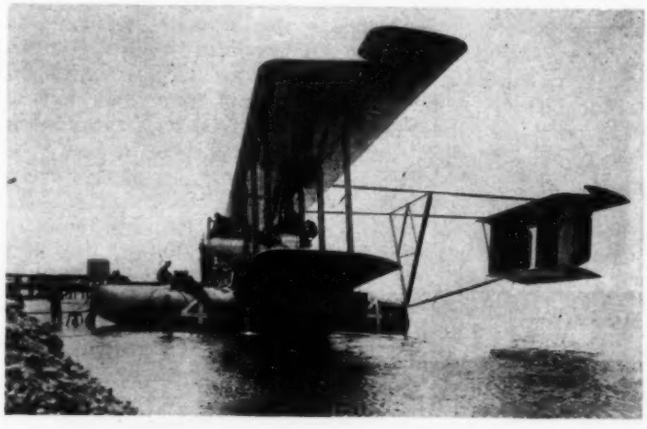


Captain Sacadura and Continho taxiing their "Eagle" Rolls powered Fairey seaplane on the water.

course near Paris, France. Thus the difference in speed between land planes and seaplanes was raised to 93 m.p.h.

The breaking of world's records seeming to be the vogue, Lieutenant Macready took a supercharged Packard Lepere biplane up to 34.508 ft. at McCook Field on September 28, and established a new world's altitude record. The plane was the same one used by Major Schroeder when he hit 33,114 ft. on February 26, 1920. At the time Lieutenant Macready was not credited with the world's record due to the fact that a French pilot had hit some 40,000 ft. However, in 1928 it was discovered that the French pilot had not played "according to Hoyle" and his altitdue marks were removed from the record books and the record awarded to Lieutenant Macready for his flight on Jan. 29, 1926. Of course the record when awarded was short lived, but details regarding that will be mentioned later.

The second Pulitzer Trophy Race was held at Omaha, Neb., on Nov. 3, 1921, and the blue ribbon won by Bert Acosta who flew his C-12 powered Curtiss-Navy racer over the 153.59 mi. course in 52 min. 9 sec. at an average speed of 176.7 m.p.h., which was entered in the record



The Navy NC-4, the first airplane to cross the Atlantic Ocean.

book as a world's record for speed over a closed course.

Back to America came the world's endurance record on December 29 and 30. During that time Edward Stinson and Loyd Bertaud stayed aloft in a Larsen JL-6 monoplane, powered with a 185 hp. B.M.W. engine, for 26 hr. 19 min. 35 sec. This mark beat the record set by Boussoutrot and Bernard the year before by two hours.

The year of 1922 saw the wholesale attempts to set new speed and endurance marks, which, incidentally were more than successful. The first aerial event of the year, however, was the first air crossing of the South Atlantic, which took place between March 30 and June 17. On the first date mentioned Captain Sacadura and Captain Continho of the Portuguese Army took off from the water at Lisbon, Portgual, in a Rolls Royce "Eagle" powered Fairey seaplane and set their course for the next stop en route to Pernambuco, Brazil, 3,200 mi. away. Misfortune upon misfortune befell the ocean fliers but finally on June 17 they reached their objective after having abandoned two planes.

The next affair was the seaplane classic for 1922, the Schneider Trophy Contest held at Naples, Italy, on August 12. This year an English pilot, Capt. Henry Charles Biard of the Supermarine Works of Great Britain, showed his elevators to the other entries and won the 200 nautical mile race in a Supermarine "Sea Lion" Mark II powered with a 450 hp. Napier "Lion" engine. Captain Biard covered the course in 1 hr. 34 min. 57.60 sec., at an average speed of 145 m.p.h. Thirteen days later Brak-Papa, the well known Fiat test pilot, boosted the land plane speed mark to 208.5 m.p.h. with a 700 hp. Fiat powered Fiat racing plane at Milan, Italy.

On September 5, the first Coast to Coast trip within 24 hr. was made by Lieut. James H. Doolittle when he piloted his Curtiss-Navy racer from Jacksonville, Fla., to San Diego, Calif., in exactly 22 hr. 35 min. including a 1 hr. 15 min. stop at Kelly Field, Tex.

Not desiring the endurance record to remain on the U. S. side of the Atlantic Ocean for any great length of time, Boussoutrot and Drouhin took up a twin engine (300 hp. Renault) Farman Goliath at Le Bourget, Paris, on October 14 and stayed up until they had bettered the

record held by Stinson and Bertaud by more than 12 hr. The exact time of the Frenchmen's sojourn above terra firma was 34 hr. 14 min. 8.5 sec. However, as a matter of record it should be mentioned that on October 5 and 6 Lieutenants Macready and Oakley G. Kelly stayed up 35 hr. 18 min. 30 sec. in an Army T-2 Fokker monoplane (400 hp. Liberty) over Rockwell Field, San Diego. The flight was not recorded as an official endurance record due to the fact that when they had taken off Macready and Kelly had intended to try a non-stop flight east, but once aloft had changed their minds and decided to stay up as long as possible. Consequently the flight did not stand as a record owing to the fact that according to F.A.I. rules the contest committee of the national aero organization had not been notified of any attempt to try for a new endurance record. Perhaps it might be well to mention here that Macready and Kelly proved that it could be done the second time, but that event took place during the following year.

On the same day that Bossoutrot and Drouhin hung up a new endurance record Lieut. R. L. Maughan took first honors in the third Pultizer Trophy race held at Selfridge Field, Mt. Clemens, Mich. Flying an Army Curtiss biplane powered with a Curtiss D-12 engine, Lieutenant Maughan covered the 250 mi. course at an average speed of 205.8 m.p.h. and established a world's speed mark of 205.31 m.p.h. for 100 km., and a world's speed mark of 205.94 for 200 km.

A world's one kilometer speed mark of 212.74 m.p.h. that had been set by Sadi Lecointe in a Nieuport-Delage on September 21, went out the window on October 18 when Brig. Gen. Wm. A. Mitchell tore down a one kilometer straight-away course at Mitchell Field, L. I. in a D-12 powered Army-Curtiss at a top speed of 224.58 m.p.h. This breaking by about 12 m.p.h. the world's speed mark concluded the record breaking performances.

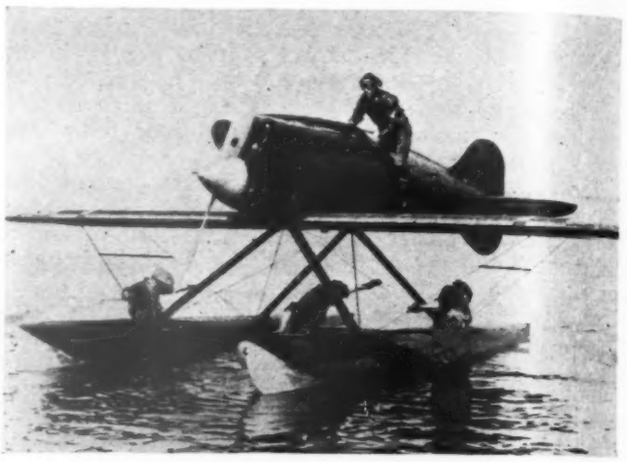
The year of 1923 was somewhat like 1922 as regards the wholesale slaughter of airplane records. Having lost his speed crown to General Mitchell, Sadi Lecointe promptly proceeded to retrieve it on February 15 by pilot-

Coste and Lebrix taxiing their famous plane on Mitchell Field, L. I., N. Y.

ing his 300 hp. Hisso Nieuport-Delage "Sesquiplane" over the one kilometer course at Marseilles at 234.66 m.p.h. However, once again the French speed artist enjoyed possession of the speed record for but a short time. On March 26 Lieutenant Maughan flew a D-12 engined Army-Curtiss racer 236.587 m.p.h. at McCook Field, and three days later Lieutenant L. J. Maitland, of Oakland to Hawaii fame, took up the same plane and shoved the speed mark up to 239.95 m.p.h.

Possession of the world's endurance record by Lieutenants Macready and Kelly was at last obtained on March 29 when they landed their Army T2 Fokker at McCook Field after a stay aloft of 36 hr. 4 min. 34 sec., a matter of 44 min. better than their time aloft in 1922, and almost two hours better than the time hung up by the Frenchmen, Boussoutrot and Drouhin. Just to show that the plane was still good for record breaking Macready and Kelly took it off on May 2 and flew non-stop from San Diego to New York, a distance of 2,516.35 mi. in 26 hr. 50 min. This was the first west-east transcontinental non-stop flight in history.

Up to this time the United States had been among the also rans in the Schnieder Trophy Contest, but on Sep-



Maj. Mario De Bernardi in his 1926 *Schneider Trophy Contest winner, a Fiat-Macchi M-39.*

tember 28 Lieut. David Rittenhouse, U.S.N. won the coveted trophy for the U. S. by piloting his D-12 460 hp. powered Curtiss-Navy seaplane racer over the course at Cowes, Isle of Wight, England at an average speed of 177.38 m.p.h. In winning this race Lieutenant Rittenhouse also annexed the world's speed marks for 100 and 200 km. Following closely on the Schneider Trophy victory, Lieut. "Al" Williams, another Navy pilot, won the 1923 Pulitzer Trophy race held at St. Louis, Mo., on October 6. When Lieutenant Williams flashed across the finish line up when the world's speed mark to 243.67 m.p.h

The next pilot to set up a new world's record was none other than Sadi Lecointe. But this time he turned his attention to going up rather than level flight speed, and on October 30 sailed aloft in a 300 Hisso powered Nieuport Delage to 36,564.8 ft. above Issy, France, breaking by more than 1,000 ft. the record set by Macready on Sept. 28, 1921.

The last achievement of the year was another successful attempt to establish a world's speed mark. On November 4, Lieut. Al Williams flew a D-12 Curtiss-Navy racer over a three kilometer course at Mitchell Field at an average speed of 266.59 m.p.h. Thus the year ended with the United States in possession of 33 out of 42 world's airplane records, 22 of which had been set by Navy pilots and 11 by Army pilots.

The year of 1924 will always remain an outstanding period of 365 days in American aeronautical history, for it was during this year that three American planes, powered by three American engines and piloted by six American men circled the world by air for the first time in the history of man. The flight was commenced from Seattle, Wash. on April 2, and completed at that same point on September 8 after a trip of 27,553 mi. in a total flying time of 371 hr. 11 min. Four Douglas World Cruisers each powered with a 400 hp. Liberty engine started the trip but one was forced out due to a crash in Alaska. The personnel that completed the trip was Capt. Lowell H.

Smith and Lieut. Leslie P. Arnold on the "Chicago No. 2;" Lieut. Erik H. Nelson and Lieut. John Harding, Jr., on the "New Orleans No. 4;" and Lieut. Leigh Wade and Lieut. Henry H. Ogden on the "Boston No. 3."

The average number of miles per day flown by the trio was 156 and the average speed throughout the entire trip was 70 m.p.h. From Seattle to Calcutta the planes were fitted as seaplanes. From Calcutta to Brough, Scotland, the planes were fitted as land planes. From that point to Boston floats were again used, and from the Bay State capitol to the finish line at Seattle the ground landing gear was used.

In an attempt on May 21 to regain the altitude record for the United States, Lieutenant Macready was what might be termed as 50 per cent. successful. The world's mark stayed at 36,564.8 ft., but Lieutenant Macready set a new American altitude mark by getting his 400 hp. Liberty Lepere up to 35,239 ft. The flight was made over McCook Field, Dayton, O.

American airplane achievements having held the center of the stage for the first part of 1924, two French military fliers, Lieut. Pelletier D'Oisy and Sergt. Bernard Besin took off at Paris, France, in a Breguet 19A2 day bomber powered with a 400 hp. Lorriane-Dietrich engine and headed for Tokio, Japan, some 12,350 mi. distant. Unfortunately a crash at Shanghai, China, delayed the flight for several days but on the forty seventh day out from Paris the pair landed at Tokio in a Breguet 14A2 presented to them by the Chinese Government. The total flying time for the trip was 120 hr.

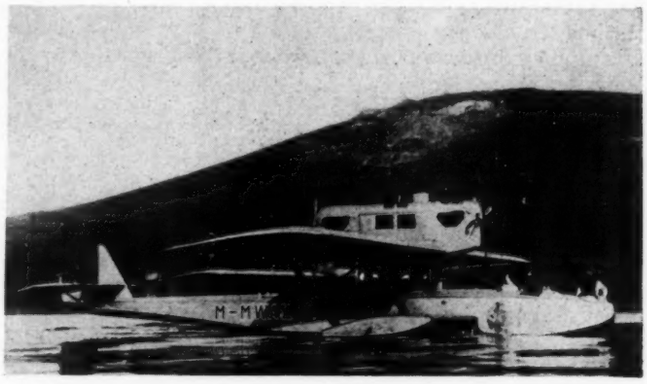
Following along the lines that "the third time never fails" Lieutenant Maughan took off from Mitchell Field, L. I. in the early dawn of June 23 and headed west on his third attempt to make a "Dawn to Dusk" flight across the United States. This time he was successful and after 21 hr. 48.50 min., including three stops en route he landed his 450 hp. Curtiss powered Curtiss PW-8 at San Francisco, Calif.

The next event of import, and incidentally the last record breaking achievement of the year, was the recapturing of the world's endurance record by two French pilots, Coupet and Drouhin. On July 16 the pair landed their 450 hp. Farman powered Farman biplane at Chartres, France, after a stay aloft of 37 hr. 59 min. 19 sec. The flight was recorded as a world record, and the time was 1 hr. 5 min. 36 sec. better than the time previously set by Lieutenant Macready.

As the series of record breaking performances ended in 1924 so did they begin in 1925. On August 7 Drouhin and Landry took up a 450 hp. Farman powered Farman biplane at Etampes, France and stayed up until they had added more than six hours to their 1924 mork. The exact time of their endurance flight was 45 hr. 11 min. 50 sec.

The next event, although unsuccessful was a most noteworthy event in-so-far as it went. On August 31 a Navy PN-9 flyingboat, powered with two 500 hp. Packard engines, and commanded by Comdr. John Rogers, with Lieut. Byron Connell, second in command, took off from the waters of San Pablo Bay, Calif., at the start of an attempt to fly non-stop to Honolulu, Hawaii. Unfortunately the plane was forced down onto the water a few miles short of its goal, but the distance that it did travel, some 1,992 statute miles, constituted a new world's non-stop seaplane and flyingboat record.

The Navy having come to the fore, the Army proceeded to step into the record breaking picture. Lieut. Cyrus Bettis was the main character involved and the part he played consisted of winning the 1925 Pulitzer Trophy

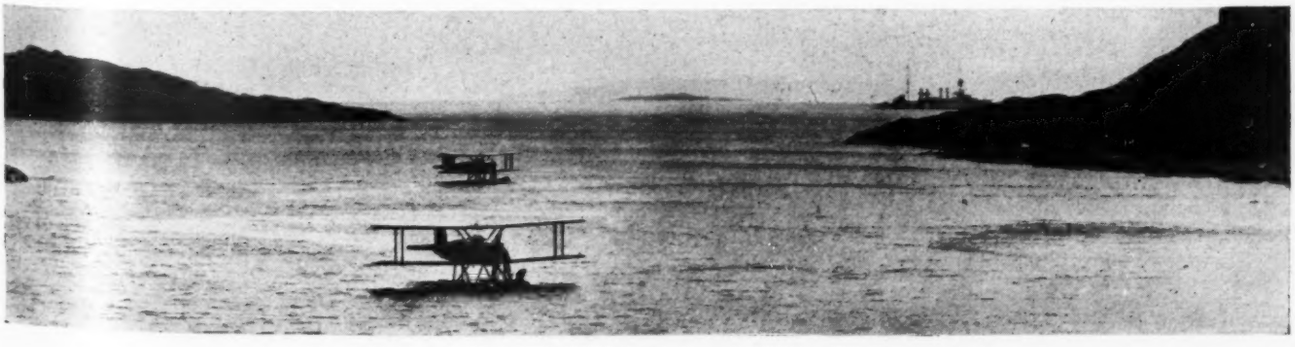


Comdr. Ramon Franco's trans-South Atlantic flyingboat at Palos, Spain.

race at Mitchell Field, on October 12 in a Curtiss-Army R3C1 plane powered with a 619 hp. Curtiss V-1400 engine. Lieutenant Bettis' average speed for the course was 248.975 m.p.h A world's 100 km. mark of 249.342 m.p.h. was established by the winning flight as well as a world's 200 km. mark of 248.975 m.p.h.

For the second time in succession the United States was declared the winner of the Schneider Trophy Contest when, on October 26, Lieutenant Doolittle piloted his Curtiss-Army racer over the 350 mi. course at Bay Shore, Md., at an average speed of 232.573 m.p.h. Two world's records went with first prize; the 100 km. seaplane mark of 234.772 m.p.h. and the 200 km. seaplane mark of 234.355 m.p.h. It is interesting to note that there was an increase of over 55 m.p.h. in the speed of racing seaplanes between the 1923 and 1925 Schneider Trophy Contests.

The seaplane speed mark was further increased on the day following the race at Bay Shore. Piloting the same plane Lieutenant Doolittle succeeded in hanging up a new mark of 245.713 m.p.h A fitting comparison between seaplane and land plane top speeds can be made at this point. It so happened that Lieutenant Doolittle set his new seaplane speed mark of 245.713 m.p.h. in exactly the same plane that Lieutenant Bettis flew to first place in the Pulitzer Trophy race earlier in the month at a speed of



Two of the "Round the World" planes riding anchor on Indian Harbor, Laborador.

249.342 m.p.h. for 100 km. The only difference was that Lieutenant Bettis used a landing gear and Lieutenant Doolittle used floats. Thus in 1925 there was a difference of a little under four miles per hour between the top speeds of seaplanes and land planes.

The final event of the year was the completion on November 7 of a 34,000 mi. flight (Rome-Melbourne-Tokio-Rome) by Commander DePinedo, the Italian airman, in a Savoia flyingboat.

The opening record breaking event of 1926 was another successful attempt to set up a new world's altitude record by Lieutenant Macready. Piloting the supercharged Liberty (400 hp.) Lepere biplane, Lieutenant Macready reached 38,704 ft. over McCook Field on January 29. Thus the record was taken away from the French airman, Sadi Lecointe.

Seven days prior to the breaking of the altitude record Commander Ramon Franco and a crew of three started a 6,232 mi., six stop, flight from Spain to Argentina. The flight was completed on February 10 and the total time spent in the air was 60 hr. 59 min. The plane Commander Franco used on this famous flight over the South Atlantic was a twin engined (450 hp. Napier "Lion") Dornier "Wal" flyingboat.

On March 13 Alan J. Cobham arrived at Croydon Airdrome, England, and the end of a round trip flight to Capetown, South Africa. Mr. Cobham left England on Nov. 16, 1925, and arrived at Capetown on Feb. 17, 1926. The plane used on this famous cross-country flight was a single engined DH-50 commercial biplane.

Then followed the outstanding flight of the year, the reaching of the North Pole by airplane. On May 9, a three Wright "Whirlwind" powered Fokker monoplane (Josephine Ford) commanded by Comdr. R. E. Byrd and piloted by Lieut. Floyd Bennet left Spitzbergen and made the trip to the Pole and back in 15 hr. The time taken on the flight to the Pole was 8 hr. 34 min. This feat was regarded as the greatest piloting and navigating accomplishment thus far.

Two famous long distance flights were accomplished next. The first was a Paris-Peking flight made in six days 18 hr. (June 11-17) by the crack French long distance pilot, Pelletier D'Oisy. The second was a non-stop record flight of 2,930 mi. between Paris, France, and Omsk, Siberia, by two French military pilots, Captain Girier and Lieutenant Dordilly.

A little over three months later, Oct. 28-29 to be exact, a new world's non-stop distance record was established by a third pair of French airmen, Coste and Rignot. Flying a 450 hp. Hisso powered Breguet XIX biplane they covered a distance of 3,415 mi. between Paris and Djask, Persia.

At the 1926 Schneider Trophy Contest it was Italy's turn to go away with the blue ribbon. Flying an 800 hp. Fiat engined scarlet colored Macchi M-39 seaplane Major de Bernardi flashed across the finish line with an average speed for the course of 244.496 m.p.h. Three days later the Italian pilot hung up a world's speed record for both land planes and seaplanes by traveling 258.873 m.p.h over the Schneider Trophy Contest course at Hampton Roads, Va. Thus for the first time since the beginning of flight the land plane had to retire to the background when it came to the matter of speed.

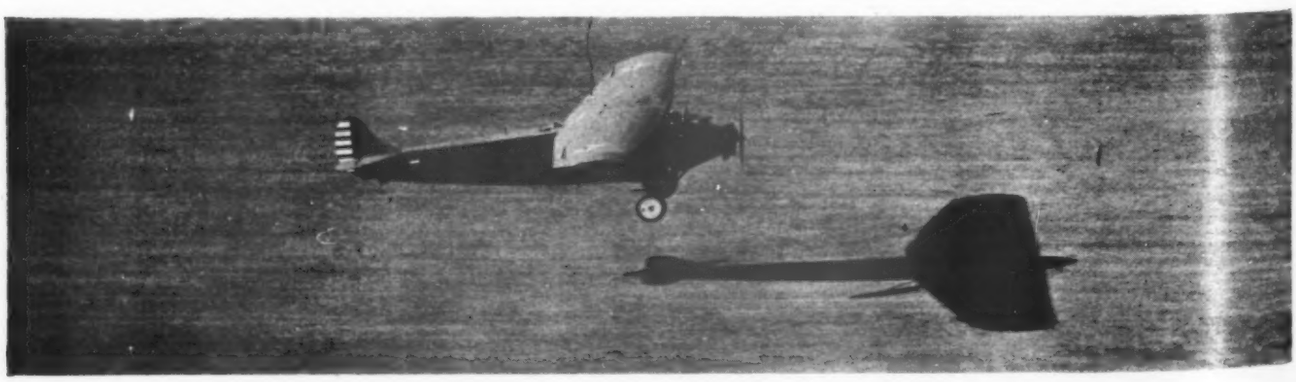
And then came the year of 1927 . . . the greatest year in aeronautical history as regards the accomplishment of airplanes and airmen . . . the great year during which the realization of the true value of the most modern means of transportation took root in the public's mind . . . the year which came as a godsend to all those who had sacrificed so much that aviation might carry on . . . indeed, a year of dreams come true!

The 1927 Schneider Trophy contest winning Supermarine-Napier S-5.

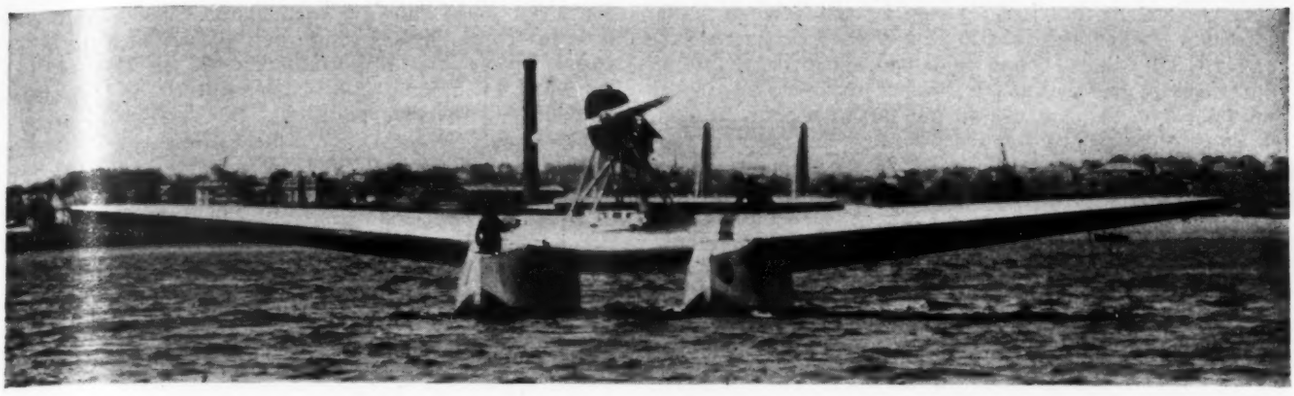
The first event was the start from Cagliari, Sardina, on February 13, of a 25,000 mi., four continent flight by Commander DePinedo in a Savoia flyingboat. Commander DePinedo crossed the South Atlantic by stages to South America, then carried on up into the United States, where a most unfortunate accident resulted in the loss of his craft. Then with a new flyingboat up to Newfoundland, thence to the Azores and on to Ostia, where he was welcomed by Mussolini on June 16.

Next came the capturing of the world's endurance record by Clarence D. Chamberlin and Bert Acosta in the Whirlwind powered Bellanca monoplane "Columbia." On April 12 Chamberlin and Acosta took off from Roosevelt Field, L. I., and on April 14 they landed again with a new world's record of 51 hr. 11 min. 26 sec. to their credit.

On May 2 four Pan American Loening Amphibians re-



The start of the Maitland-Hegenberger non-stop flight to the Hawaiian Islands.



Commander de Pinedo's flyingboat riding anchor on Boston Harbor.

turned to Bolling Field, Washington, D. C., and the end of a 20,500 mi. good-will flight through Central and South America and the West Indies. The flight was under the command of Maj. H. A. Darque and began from San Antonio, Tex., on Dec. 20, 1926.

Exactly eight days after the return of Major Darque's flight of planes a young pilot, little known outside of the airmail service, and named Charles A. Lindbergh, made a 14 hr. 5 min., one stop, flight from San Diego, Calif., to Roosevelt Field, L. I. The plane that he flew was a Whirlwind powered Ryan monoplane named the "Spirit of St. Louis." Upon his arrival the young pilot began to prepare his plane to attempt a solo non-stop flight to Paris, France, and the $25,00 Orteig prize.

It is quite probable that there does not breath a man or woman in the civilized world that does not know the result of that attempt by Charles A. Lindbergh. For the sake of the records the start was made from Roosevelt Field in the early dawn of May 20, and 33 hr. 29 min. 30 sec. later a landing was made at Le Bourget Field, outside of Paris. The distance traveled was 3,610 mi. and the average speed made during the non-stop trip was 108 m.p.h.

The second non-stop crossing of the North Atlantic was accomplished on June 5 when Clarence D. Chamberlin, with Charles A. Levine as passenger, landed the endurance record breaking "Columbia" at Helfta, Germany, after a 3,905 mi. non-stop flight from Roosevelt Field. The time taken for that great flight was 43 hr. In making the flight Chamberlin established a new world's non-stop distance record.

The North Atlantic having been crossed twice the attention of the world was directed to the Pacific. On June 28 Lieut. Lester D. Maitland and Lieut. Albert Hegenberger took off from the Oakland Airport, California, in a three Whirlwind engined Fokker Army transport monoplane. Twenty-five hours and fifteen minutes later they landed at Wheeler Field, Oahu, Hawaiian Islands, the first airmen to successfully link the Mainland and the Islands in a non-stop flight. The airline distance between the two points is 2,400 mi.

On the day that the Army Fokker landed in Hawaii, another Fokker, (America) (three Whirlwinds) commanded by Comdr. R. E. Byrd, with Bernt Balchen and Bert Acosta as pilots and Lieut. George Noville as radio officer, took off from Roosevelt Field and headed for Paris. After a "blind" flight lasting 40 hr. 19 min. the plane was landed in the water 200 yd. off the shores of Ver-Sur-Mer, France, and 3,477 mi. from the take-off point.

July 4 saw the establishing of a new world's seaplane altitude record. On that day Lieut. C. C. Champion took a Navy "Apache" seaplane powered with a supercharged "Wasp" engine up to a record height of 37,995 ft. at Anacostia, Washington, D.C. Twenty-one days later Lieutenant Champion set a world's altitude record tor all types of airplanes when he took the same plane up to 38,474 ft.

The Pacific Ocean from California to the Hawaiian Island was successfully crossed non-stop by air for the second time on July 13 and 14. This time the honor was achieved by two civilian pilots, Ernest L. Smith and Emory B. Bronte. Flying a Travel Air monoplane fitted with a Whirlwind engine they took the plane off the Oakland Airport and flew non-stop to a point 93 mi. southeast of Wheeler Field, their original objective. The

The "Spirit of St. Louis" on its way to Le Bourget Field, Paris, France.

distance flown was 2,348 mi. and the time taken to complete the flight was 25 hr. 36 min.

On July 20, Col. Charles A. Lindbergh began a country-wide tour of the United States under the auspices of the Daniel Guggenheim Foundation for the Promotion of Aeronautics. Flying the famous Spirit of St. Louis, Colonel Lindbergh visited each one of the 48 states in the Union and returned to his starting point in New York City on October 23. The total distance traveled on the tour was 20,350 mi. and the total flying time was 260 hr.

The next event of importance took place on the other side of the Atlantic. Piloting a Junkers J-33-1 mono-

plane powered with a Junkers engine, two German pilots, Cornelius Edzard and Johann Risticz took off from German soil on August 3 and remained aloft for 52 hr. 53 min. 8 sec., a new world's endurance record. Two other famous flights were made during the month of August. As a matter of fact, it was three famous flights.

The first was a 26 hr. 17 min. 33 sec. non-stop flight from Oakland Airport, California, to Wheeler Field, Hawaii, on August 16 and 17 by Arthur C. Goebel and Lieut. W. V. Davis in a Whirlwind powered Travel Air monoplane. By making that flight the pair won first place in the Dole Derby. The second famous flight was the flying of the same route on the same days by Martin Jensen and Paul Schulter in a Whirlwind Breese monoplane. The time was 28 hr. 16 min. and the honor gained was second place in the Dole Derby.

The third famous flight was an attempt by Edward F. Schlee and William S. Brock to establish a new "round the world" record in a Stinson monoplane (Pride of Detroit) fitted with a Whirlwind. After flying the North Atlantic non-stop and continuing on to Tokio, Japan, well ahead of the schedule, the fliers abandoned the attempt due to public opinion regarding their plan to fly the Pacific. The flight was begun from Harbor Grace, N. F. on August 27 and by the time they decided to give up the trip, 18 days later, Brock and Schlee had traveled 12,295 mi. in 145 hr. 30 min. flying time.

The 1927 Schneider Trophy Contest was the next event to bring forth a new airplane record. Piloting a Supermarine Napier S-5, Flight Lieut. S. W. Webster, R. A. F. covered the course at Venice, Italy, on September 25 at an average speed of 281.488 m.p.h. That speed mark constituted a new world's record for all types of planes.

Haldeman is Forced Down

Another attempt to cross the North Atlantic non-stop by air during 1927 was begun on October 10. While the flight was not successful as regards reaching the other side of the ocean, a new non-stop over-water flight record was made. Therefore, a recording of the details of the flight is not out of place in this article. The personnel of the flight consisted of George Haldeman, pilot, and Miss Ruth Elder, passenger. The plane used was a Stinson monoplane powered with a Whirlwind, and the distance traveled from the point of the take-off, Roosevelt Field, to the spot where the plane was forced down onto the water, 325 mi. northeast of the Azores, was 2,623 mi.

On the same day that Haldeman took his plane off the Roosevelt Field runway, Lieutenants Coste and Le Brix took off from Paris, France, at the start of a 35,000 mi. aerial voyage that was completed at the starting point on April 14, 1928. The plane used by the two famous French long distance pilots was the 450 hp. Hisso powered Breguet XIX biplane which Lieutenant Coste used on his record breaking Paris-Djask flight in 1926. The route followed to the United States was much the same as that flown by Commander DePinedo, with the exception that the French airmen followed the east coast of the U. S. up to New York City. Then the pair flew across the continent and crossed the Pacific by boat, and then carried on to Paris. The total number of flying hours during the trip was 338.

A New World's Speed Record

For the second time during the year of 1927, a new world's speed record for all types of airplanes was established on November 4. This time it was the well known Italian speed artist, Maj. Mario de Bernardi, who hung up the new figures. Flying a Fiat powered Macchi M-52 racing seaplane, Major de Bernardi made a speed of 297.816 m.p.h. over the Schneider Trophy Contest course at Venice, Italy.

The last great flight of this great year was made by the most famous of all pilots of present times, Col. Charles A. Lindbergh. On December 13, Colonel Lindbergh took off from Bolling Field, Washington, D. C. in the Spirit of St. Louis and flew non-stop to Mexico City, Mexico, a distance of 2,600 mi. in 27 hr. flat. That flight was the beginning of a 9,060 mi. good-will tour through Central America which was completed at St. Louis, Mo., on Feb. 13, 1928. During the tour Colonel Lindbergh made 16 stops and spent 116 hr. 30 min. in the air.

The first aerial achievement of 1928, the 25th year of flight, was a solo flight by an English pilot, Harold "Bert" Hinkler, in an 80 hp. Cirrus powered Avro "Avian" biplane from Croydon Airport, London, England, to Port Darwin, Australia, in a flying time of 134 hr. The start was made on February 7 and the 12,000 mi. trip was completed on February 22. The average speed throughout the flight was between 90 and 100 m.p.h.

March 30 was a day on which two different world's records were established. The first was a new endurance mark of 53 hr. 36 min. 30 sec. set up by Edward Stinson and George Haldeman in a Stinson monoplane with a

Captain Kingsford-Smith's U. S. to Australia three Whirlwind powered Fokker monoplane "Southern Cross."

Whirlwind engine. The flight was made at Jacksonville, Fla., and the time aloft was 1 hr. 13 min. 19 sec. better than the old record held by the German pilots Edzard and Risticz.

The second new record was one for speed, and was made by Major de Bernardi in his Fiat-Macchi racer over the Schneider Trophy Contest course at Venice. The new speed reached was 318.624 m.p.h., an increase of almost 21 m.p.h. over the previous mark made by the same pilot in the same plane and at the same place.

The East-West Atlantic Crossing

Then came the first successful east-west crossing of the North Atlantic by a heavier-than-air craft. On April 13 Capt. Herman Koehl, a German, Baron Guther von Huenefeld, also a German, and Col. James Fitzmaurice, an Irishman, took off from Baldonnel Airdrome, Dublin, Ireland, in a 310 hp. Junkers powered Junkers L-5 monoplane (Bremen). About 37 hr. later the plane was forced down on the icy wastes of Greenely Island in Strait of Belle Isle, between Newfoundland and the lower coast of Labrador. The airline distance between those two points is 2,125 mi.

The 1928 airplane conquest of the North Pole regions was accomplished on April 15 and 16. Flying a Wasp powered Lockheed monoplane, Capt. George H. Wilkins and Lieut. Carl B. Eielson went non-stop from Point Barrow, Alaska, to Dead Man's Island, 25 mi. north of Green Harbor, Spitzbergen. The distance traveled was 2,200 mi. and the time was 20 hr. 20 min. Five days later the plane was flown to Spitzbergen.

May 31 marked the beginning of the greatest long distance flight yet attempted and accomplished. Using a three Whirlwind powered Fokker monoplane (Southern Cross) Capt. Charles Kingsford-Smith, Charles T. P. Ulm, Lieut. "Harry" W. Lyons, and James Warner, flew from Oakland Airport, California, to Melbourne, Australia, in a series of five flights, three of which were over water. The first, Oakland Airport to Hawaii, a distance of 2,400 mi., was made in 27 hr. 28 min. The second, Hawaii to the Fiji Islands, a distance of 3,138 mi., was made in 34 hr. 33 min. That flight established a new world's record for non-stop over-water flying. The third flight, Fiji Islands to Brisbane, Australia, a distance of 1,762 mi. was made in 21 hr. 18 min. The fourth flight was to Sydney, a distance of 500 mi., and the last leg was to Melbourne and the end of a 7,800 mi. air voyage across the Pacific waters.

Italians Set Endurance Record

The world's endurance record was next to receive noticeable attention. On June 2, Maj. Arturo Ferrarin and Comdr. P. del Prete, both famous Italian pilots, took up a 500 hp. Fiat powered Savoia-Marchetti S.64 monoplane over Rome, Italy, and stayed aloft until that had bettered by five hours the old endurance record, set by Stinson and Haldeman. The exact time of the flight was 58 hr. 37 min.

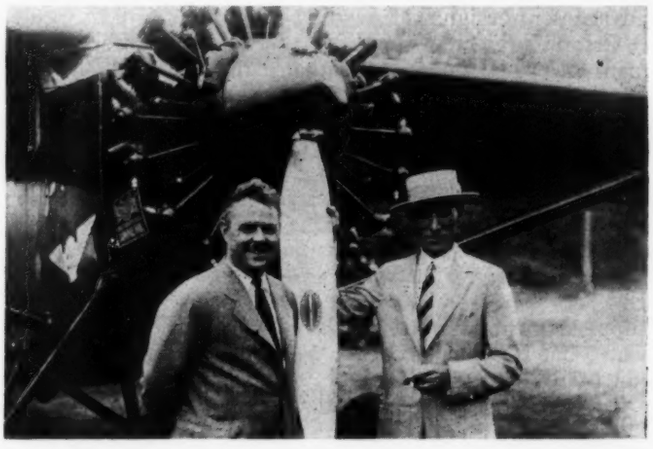
The first 1928 west-east crossing of the North Atlantic, and incidentally the first non-stop crossing either way by a member of the fair sex, was accomplished on June 17 and 18. Flying a three Whirlwind engined Fokker monoplane (Friendship) Wilmer Stultz, pilot, Louis Gordon, mechanic and co-pilot, and Miss Amelia Earhart, passenger, went from Trepassey, N. F. to Burry Port, South Wales, England in 20 hr. 40 min.

Having acquired the world's endurance record, Major Ferrarin and Commander del Prete proceeded to annex the world's non-stop distance record on July 5. Using the same plane that stayed aloft longer than any other plane in the world, the two Italian airmen took off from Montecelio Airport, near Rome, Italy, and flew non-stop to Port Natal, Brazil, a distance of 4,475 mi. in 51 hr. even.

Two days later, however, they lost their endurance record to the German pilots, Risticz and Zimmerman who stayed aloft in a Junkers powered Junkers monoplane for 65 hr. 31 min. The flight was made over Dessau, Germany, and the difference in time between the old and the new record (not broken to date) is 6 hr. 42 min.

July 22 saw the start of a successful attempt to lower the Round the World record by Capt. C. B. D. Collyer and John H. Mears. The plane used was a Fairchild Cabin Monoplane (City of New York) powered with a Wasp engine. The new time mark established was 23 days 15 hr. Of the total 19,725 mi. traveled, 11,190 mi. were traveled by air.

The transcontinental non-stop record of 26 hr. 50 min. established by Lieutenants Macready and Kelly May 2-3, 1923 was reduced to 18 hr. 58 min. on August 20-21 by Col. Arthur Goebel with Harry Tucker, as passenger,



Brock (left) and Schlee in front of their famous Stinson monoplane "Pride of Detroit."

in a Wasp engined Lockheed monoplane (Yankee Doodle). It should be noted here however that Macready and Kelly flew from the east coast to the west coast, whereas Goebel and Tucker made their fast time on a west-east flight. However, it was but a matter of a little over two months (October 25) when Captain Collyer, with Tucker as a passenger, flew the Yankee Doodle from New York to Los Angeles in 24 hr. 51 min., a matter of 1 hr. 59 min. less than the time of the 1923 east-west trip.

The last noteworthy airplane performance of 1928 (that is, up to the time that this issue goes to press) was the setting of a high speed mark of 319.57 m.p.h. on November 4. The speed was attained with a Supermarine Napier S-5, fitted with a Napier "Lion" engine, and piloted by Flight Lieut. D'Arcy Greig, over a course at Calshot, England. As the speed was only .95 m.p.h. faster than the existing world's record it could not be recorded as a new world's speed record, as, according to the ruling, there must be an increase of at least five miles per hour over the existing record. On the day before Flight Lieutenant Greig went 319.57 m.p.h. under official observation, he had been clocked at 345 m.p.h by unofficial timers.

What records will go by the board in 1929 is a matter for speculation. However, it might not be amiss to predict that the speed record will be increased to around 350 m.p.h., the altitude record to over 40,000 ft., the endurance record to at least 75 hr., and the non-stop distance mark to well over 5,000 mi.

Twenty-Five Years of Airplane Design

By CAPT. H. C. RICHARDSON, (CC) U.S.N.

BROADLY speaking, design of aircraft covers aerodynamics and structural considerations, but still more broadly it involves power plant and equipment, for these latter have had an important bearing on advances in design.

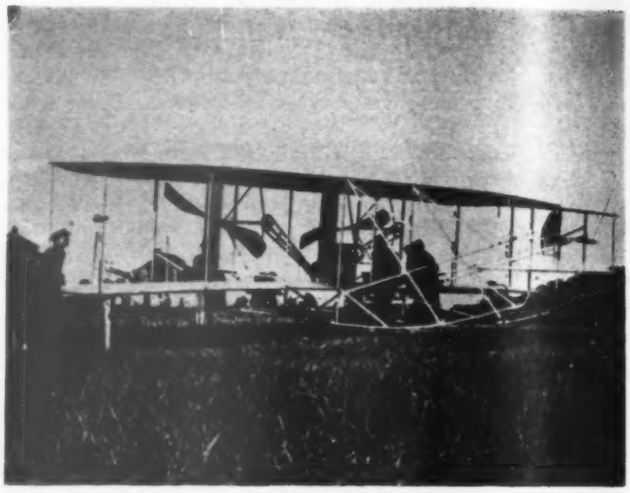
Prior to the first successful flight of a power driven man carrying plane, Lillenthal, Chanute, the Wright Brothers and Montgomery had made some progress with glider experiments. Langley used the whirling arm to gain data on flat plates and later cambered plates, but although he used this latter data in constructing his power driven models, this data has never been published except as relates to the models and the full sized, power-driven plane. Lillenthal's data was not extensive and some of it was incorrect. It was because of this that the Wright Brothers were forced to the use of a wind tunnel which supplied them with the necessary data, not only for their plane, but for their propeller design, but this data too has not been published.

It was not until 1911, with the publication of Eiffel's "The Resistance of the Air and Aviation," that aerodynamic data as to wings and structural features became available in usable form, and individual designers relied on their own data in the development of airfoils and controls. Developments to this stage may be said to rest largely on cut and try methods, so that except for the

Front quarter view of the "Hudson Flyer; one of the early types of Curtiss planes.

Wright Brothers and the Aerial Experiment Association of Graham Bell, Curtiss, Selfridge and Baldwin, design was more or less haphazard until Eiffel's data was made public.

From this point on advances were rapid. Data became vailable from Goettingen, the National Physical Laboratory in England, the wind tunnels at the Navy Yard, Washington, D. C., M. I. T., Leland Stanford, and finally the National Advisory Committee, Langley Memorial Laboratory, and the Bureau of Standards.



A Wright biplane undergoing U. S. Army tests at Ft. Meyer, Va., in 1908.

Today data is available on hundreds of airfoils, and on streamline forms of struts, nacelles, fuselages; and other forms more or less streamlined; in reports, notes, memoranda, annual reports and many text books on design.

Today the characteristics of airfoils, streamline forms and propellers, cowling and a multiplicity of details is at hand and the data available is being augmented daily.

Stability under all conditions of flight has been studied and is still the subject of constant investigation by the world's foremost engineers. The classical work of Bryan was the first to be published.

Wind tunnel work has been coordinated with full size experiments, the most important contributors to date have been the pressure tunnel at Langley Field and the 20 ft. tunnel at the same place. High velocity tests at the Bureau of Standards have aided materially in the determination of flow at and above the speed of sound which is encountered in propeller design.

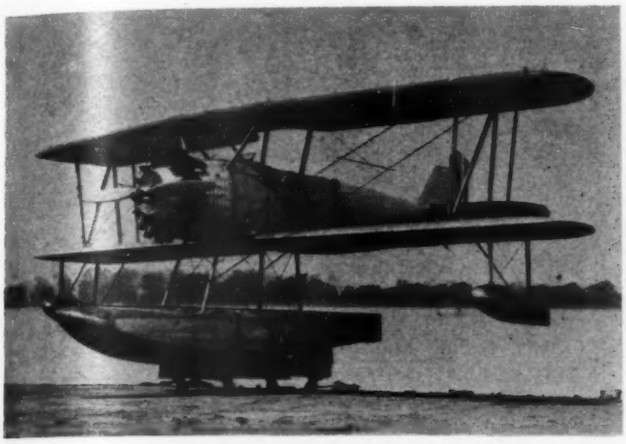
Prandtl's corrections for wall interference in tunnels and the recognition of the importance of Reynold's numbers as affecting the scaling up of model tests to full sized conditions have enabled the employment of wind tunnels in the prediction of full scale performance to a satisfactory degree.

Theories of air flow about airfoils have advanced to the stage where theory and model results are in close agree-

ment. The effects of the boundary layer are being better understood.

High speed motion pictures have revealed a confirmation of important theories, a classical demonstration being that of Baron Shiba of Japan.

All the great nations of the world are busy applying their national resources to research of aerodynamic features. Today one of the most baffling problems is one of autorotation as presented in the uncontrolled and in



A Vought "Corsair" seaplane powered with a Pratt & Whitney "Wasp" engine.

some instances uncontrollable spinning of aircraft after entering prolonged spins.

Refinement in design is the order of the day. It involves the utilization of the most efficient airfoils, and the suppression of parasite resistance. It has become possible through the advances in structure and power plant design, and the development in structural materials.

With the constantly increasing demands for military performance, controllability and maneuverability have advanced to a remarkable degree, along with refinement in design.

Commercial development has benefited by the military development, but has other criteria than those for military craft. The new demands are bringing development not alone valuable to commercial craft, but in turn of mutual interest in the improvement in military types. The sudden increase in volume of commercial development in itself has broadened the field of development, has opened rsources for experimentation and is providing a wonderful laboratory for full scale proof of material and equipment. It is largely the difference between military and commercial demands, that has led to the general popular demand for the monoplane in preference to the biplane.

The greatest incentive to refinement of design has been the development of racing planes, and in these it is found that substantially equal results are obtainable with either the monoplane or the biplane arrangements. The Pulitzer Trophy Races and the Schneider Cup Races have been responsible for this development; and surprising as it may seem today the speed laurels rest with the seaplane.

These races have furnished the incentive for intense research which has undoubtedly had an important influence on the improvement of aerodynamic, structural and power plant development, the results of which are already reflected in commercial design.

Airfoils have passed from an efficiency of 16 to 1, ratio of L/D to well into the 20's; struts have improved from 15/1 to a 20/1 ratio of flat plate drag to section drag.

Fuselages have passed, from the stage where the crew was fully exposed to the wind blast and drag, to streamline forms having only 1/10 the drag of a flat plate having the area of the maximum section. The overall efficiency of planes has risen from 4 to better than 11.

Propeller efficiency of the geared Wright propellers was outstanding for years and attests the thoroughness of the Wright Brothers as research engineers and designers. For those days and for many days thereafter a propeller efficiency of 78 per cent. was unbeaten. Today in racers efficiencies of 85 per cent. have been attained.

Thin wing, double cambered, thick wing, equal cambered wing, each has merits for particular designs. Flaps, slots, spoilers, swelling wings, wings of variable camber, variable area, wash out, wash in, sweep back, dihedral, cathedral, wings tapered in thickness or plan or both, all have their advocates for special purposes. The whole gamut of biplane, monoplane, triplane, multiplane, sesquiplane, and tandem plane, has been played from end to end. Front controls, rear controls, front and rear controls, and tailless types have had their vogue. Of the latter, Dunne was the original in 1912, and Hill's Pterodactyl, 1926, is the latest.

Helicopters have been constant favorites with never any real success. Brennan, DeBothezat, Berliner, Piscara, Oehmichen and Karman, and many others have succeeded in flights of moderate duration on occasions. The nearest approach to this type of flight has been with the Cierva Autogiro, which is more a revolving wing that a helicopter.

Let us now turn to structures.

Lightness of structure has been an insistent demand. This demand and the warping wing control undoubtedly had much to do with the Wright selection of the biplane structure, in which it is understood Chanute was an adviser.

Stick and wire describes the early structures, and this type survived until only recently. Spruce and bamboo were early favorites for spars and struts and outrigger booms. Wing covering passed from cotton and linen cloth to rubberized fabric, veneer, plywood and metal. In some cases in the early days the cloth was laced or tacked

Aerial view of the Cierva Antgiro which was recently flown from London to Paris.

to the top surface of ribs and spars only, leaving them exposed to air flow. Wires have changed from hard round wire to strand and now streamlined wire is almost universal when exposed to air flow. The Wright spars were continuous. Panel construction was contemporaneous.

As soon as engineers entered design the continuous spar became more general. Routed spars, and built up box spars brought with them a new development in form factors as an element of design, and wing spars, under combined compression and bending loads led to refinement of design, and research best exemplified in the work of

Piffard and Pritchard. The design of columns involved research as to strength of unusually long and thin columns outside the range of existing data.

Research on distribution of air loads and the line of action of resultant pressures, governed the location of spars, and the structure of ribs, to take care of high incidence, low incidence, and inverted loading conditions. Wing form in plan was found of importance as to loading conditions. Flutter has had its influence on the proportioning of front and rear spars, in particular in tail surfaces.

Perhaps the most important influence in structural design has been the development of light alloy and high strength alloy in plates, tubes and forgings.

It has been found possible to make lighter structures in metal than was possible with wood. The engineering design has enabled closer figuring of members, because of reduced variation in the properties of the materials used and the improved fastenings possible in assemblies.

Forging, casting, rolling, drawing and extrusion process, make greater varieties of reliable materials available, so that today wood is practically eliminated from aircraft structures except for wing spars and even there inroads have been made.

In fuselages, the monocoque in woods of Deperdussin was the prototype of the modern metal monocoque structure, not only in fuselages but in wings and float decks. In light alloy plate structures the Germans have led with Junkers, Dornier, Rohrbach largely influenced by the Zeppelin development.

In France, Breguet and Wibault have done advanced work in this type.

In the United States, Stout took up the corrugated plate structures similar to Junkers, as did Kirkham also. Levasseur, in the early Antoinette monoplanes, carried to high efficiency the thicker sections first advocated by Phillips, and first applied by Junkers and Fokkers, and to the thick wings they added the tubular steel welded fuselages.

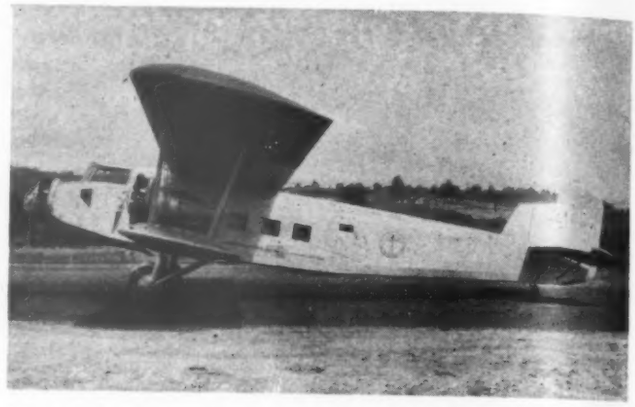
England is most advanced in corrugated spring steel spars. Sikorsky has developed the extruded dural structure to a high degree in this country. Hall has designed and constructed refined engineering structures of multiple tubular spars, and other ingenious structural elements, including die stampings.

The Lockheed "Viga" powered with a Wright "Whirlwind" engine.

England refuses to accept welding and has highly developed forgings, stampings and machined fittings to enable bolted and riveted assemblies. Aeromarine, Boeing, Consolidated, Curtiss, Douglas, Keystone, Loening, Thomas, Martin, Vought, among Government contractors have made notable contributions to development of metal structures.

The Naval Aircraft Factory and McCook—now Wright Field—have conducted research and construction in materials and design which have largely assisted the trade in development of structures. And as to materials, the Bureau of Standards has been of great assistance, particularly in the study of corrosion and protection against corrosion of light alloys.

The Aluminum Company of America and Bausch have contributed largely to the technical development and the manufacture of light alloys. Dopes, paints, varnishes and textiles enter into the engineering and design phases only indirectly, but have enabled the realization of lighter structures.



The new Boeing model 80 *transport plane, powered with three Pratt & Whitney "Hornet" engines.*

In fact, it is probable that in no other type of construction have so many trades and industries been involved in producing their finest grades of workmanship and materials toward the realization of the efficient structures required. In saying this at this point it is only proper to state that this applies also to power plant and equipment.

As to power plants—the Manley engine of the Langley Airdome was for many years outstanding. It was well ahead of its time. The Wright engine was remarkable. The gas engine was essential to the success of human flight. Both Langley and the Wrights found nothing suitable available and had to provide engines in advance of their time through their own resources.

Considerable Frontal Resistance Overcome.

Today the water cooled engine with wing radiators is the most advanced installation of the water cooled type, and the fixed radial engine is the most advanced of the air cooled type. The introduction by the Seguin Brothers of France, of the combination of a master with articulated connecting rods, into their first Gnome engines, was the essential basis for the modern success of the radial engine. Now the venturi-cowling, proved by the N. A. C. A. in the 20 foot tunnel and in free flight, promises to overcome the serious air resistance handicap of the air cooled engine.

In power-plant accessories, magnetos, spark plugs, superchargers, valves, hot spots, shielding, radiators, all are a marked advance over the early days.

Propellers have vastly improved in form and efficiency generally. In material they have passed from crossed tubes covered with cloth, through spruce, mahogany, oak and other woods, to bakelite, steel and duralumin. Even balsa and aluminum and magnesium alloys have been used.

Gearing is coming into its own though long recognized

as desirable. The Wrights recognized and used it. Variable and reversible pitch is being and must be solved.

As to equipment, instruments have won their place. Lindbergh's flight would not have been possible without them. Flight instruments are referred to. Instruments as power plant accessories were early recognized as necessary. The design of all classes of instruments has involved high grade engineering, particularly to attain the required degree of accuracy on acceptable weight and space limitation.

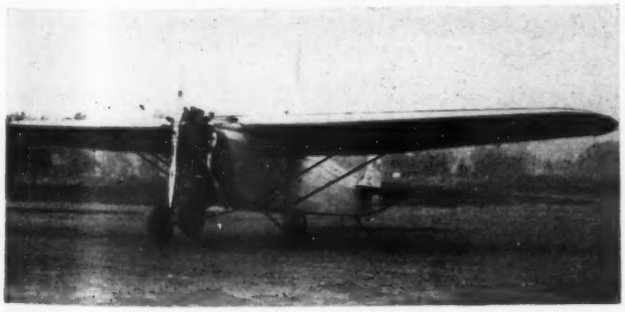
Radio equipment has been equally affected by limitations of weight and space, while still requiring to be rugged, and simple, yet reliable.

Engine starters have become essential particularly with the increase in power. Air and gas starters, electric and inertia starters of low weight have been successfully designed and built. Wheels, tires, brakes and oleo gears have had to meet new and exacting demands.

Float Design Developed

Aircraft floats and hulls have changed from wood to metal. Float design has been developed through the application of Naval Architecture to the special conditions involved in a craft where loads change through the operation of wing lift, and whose stability requirements are radically different from those for water craft. The model basin has afforded definite assistance in the development of dependable information as to performance.

Standardization has been the cry from the beginning, to a degree it has been impracticable except as to certain mechanical details and processes, for no designs were permanent to the degree that high production ever was engaged in. Recently the situation has changed as to production of certain types, principally commercially. But the art is still advancing rapidly and must not be strangled by the demand for standardization. Stress analysis procedure has been standardized to a degree and is based on the use of the best methods devised to date to determine stresses under specified conditions of loading, which are required for different types and sizes of craft and on their intended employment. Present day methods are much



A "Whirlwind" powered Fokker "Special Universal" fitted with a third landing gear wheel.

refined over the simple and crude methods of the early days. The loading distributions are based on careful research on the distribution of air loads.

The earliest standardization of features was in the control system, but this did not occur until 1916, when the foot control of the rudder, by foot bar *or* pedals, the stock *or* column control of the elevators, and the stick *or* wheel control of the ailerons was adopted, with hand control of the throttle. In effect it will be seen that while the principles of control are standardized the details are yet variable, and depend on the type and arrangement of the plane.

It would be unfair in this article to ignore a type of engineering which is rare, but deserving of the highest tribute, that of the operative engineers, the test pilots, the pioneers of yesterday and today. In the early days it was almost "blind lead the blind." Some survived new experiences and told of them, some didn't survive, and we had to guess what went wrong. Not all improvements are safe. New features, new maneuvers, new conditions to be met; new designs to be proved to the limit, or corrected. Flight test is the final check. Since the advent of the free drop parachute, conditions are much improved,

A Fairchild cabin monoplane on pontoons and fitted with with a Wright "Whirlwind."

yet its advent has led to even more daring work. Sometimes even the parachute affords no escape.

Progress in aircraft design depends upon systematic study and research in the laboratory and in full sized construction and operation.

An interesting comparison is that of the early Wright plane, tested and flown at Fort Meyer in 1908-9, and the Lockheed Vega, taken as an example of modern aircraft design.

Aerodynamically the differences are striking. Compare the wings, then a biplane, now a cantilever monoplane, their numerous struts and wires. The struts streamlined to approximate elliptical sections, the wires sound. The pilot and passenger and engine not cowled in. The outrigger elevator in front, the outrigger rudder in the rear, vs. the neat cantilever tail surfaces of the Vega and the beautifully streamlined fuselage into which the wings and landing gear are neatly faired.

In spite of the Vega's engine and ungeared propeller, the metal propeller efficiency is in excess of that of the efficient twin pusher, chain driven reduction geared wooden propellers of the Wright plane.

For launching the Wright plane required a catapult, but it avoided wheels, but the landing skids provided no resileincy and the net resistance was relatively high.

The comparison of interesting details is as follows:

	Wright	*Lockheed*
Total load—lb.	1150	3470
Wing area—sq. ft.	538	275
Landing speed—m.p.h.	26	50
Full speed—m.p.h.	40	140
B.h.p.	25	220
Lb./sq. ft.	2.14	12.6
Lb./hp.	46	15.75
Engine weight	180	585
Engine lb./hp.	7.2	2.66
Initial rate of climb—ft./min. about	100	1000
Engine Type	4 cylinder water cooled	9 cylinder—fixed radial, aircooled.
Cowling	None	Highly developed
L/D of wing section	11	19
Fuselage	Stick and wire Pilot and passengers exposed to wind.	Monocoque Pilot and passengers inclosed in streamline fuselage.

Twenty-Five Years of Engine Design

By J. H. GEISSE
Naval Aircraft Factory, Philadelphia, Pa.

THE development of the aviation engine from a "delicate" piece of mechanism weighing 10 lb. per hp. to the "robust" mechanism weighing only 1½ lb. per hp. is noteworthy mainly by the absence of any radical change in either form or operation. The engines of today are not far different from the first engines to take to the air.

The first engine to accomplish successful powered flight in heavier-than-air machines was the Wright brothers' four cylinder in-line water cooled engine. Although it might be expected that the specifications of this engine should be accurately set down as of major importance in the history of aviation, authors differ considerably in their description of it. I have before me two books and two articles, all by prominent authors, and their specifications of the engine are as follows:

Wright Brothers' First Engine.

B.HP.	R.P.M.	Bore	Stroke	Disp.	Wght.	Lb. HP.	Lb. Cu.In.	HP Cu.In.	MEP.
30/35	1200	4.375	4	240	180	6.00	.75	.125	83
24	1200	4.25	4	226	210	8.75	.93	.106	70
30	1300	4.42	3.94	241	210	7.00	.87	.125	76
12	——	4.	4	201	144	16.70	.72	.06	—

The contemporary of this engine should also go down in history as an achievement years ahead of its time. This was the Manly engine designed by C. M. Manly for the

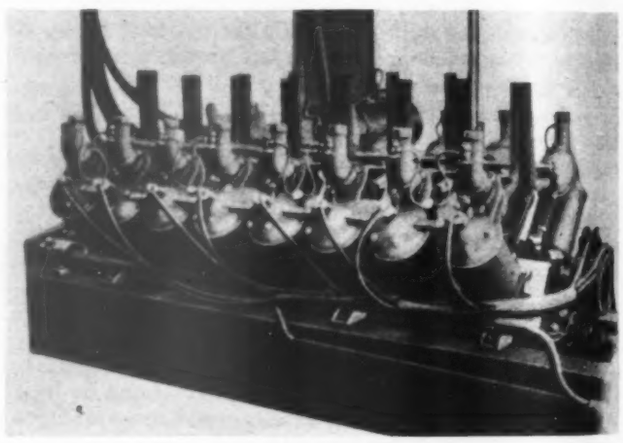
A two-cylinder opposed Wright-Morehouse aircooled engine.

Langley "Airdrome." It was a five cylinder water cooled radial engine and authors appear to agree on the following specifications:

Manly—1902

B.HP.	R.P.M.	Bore	Stroke	Disp.	Wght.	Lb. HP.	Lb. Cu.In.	HP Cu.In.	MEP.
52.4	950	5	5½	540	126	2.4	.232	.097	81

This engine was built in 1902 and is claimed to have successfully passed a 30 hr. full throttle test. The weight of this engine in lb. per cu. in. displacement is remarkable and has seldom, if ever, been beterted in any form. Its weight in lb. per hp. was less than the average of all types in 1922—20 yr. later. It is in the Smithsonian



A 16-cylinder 134 hp. steam cooled Vee type Antoinette engine built in 1907.

Museum in Washington and present day engineers might well pay it a visit.

In the succeeding years to 1910, development went ahead (or backward judged by the Manly engine), with no very definite trend. In 1910, there were more than 30 manufacturers of aviation engines and there were 76 models listed. There were air cooled radials, water cooled radials, water and air cooled "V" and vertical engines, and air cooled rotaries. The average power was about 55, and the average speed about 1200 r.p.m. Among these engines was the second aviation engine that deserves a place in aviation annals on the basis of engineering merit. This was the Antoinette engine of France. The engine was a 16 cylinder "V" type, having liquid fuel distribution and steam cooling, two features now being given considerable attention. The principal characteristics of the engine were:

French Antoinette—1910

B.HP.	R.P.M.	Bore	Stroke	Disp.	Wght.	Lb. HP.	Lb. Cu.In.	HP Cu.In.	MEP.
134	1100	4.33	4.13	973	264	2	.272	.138	99

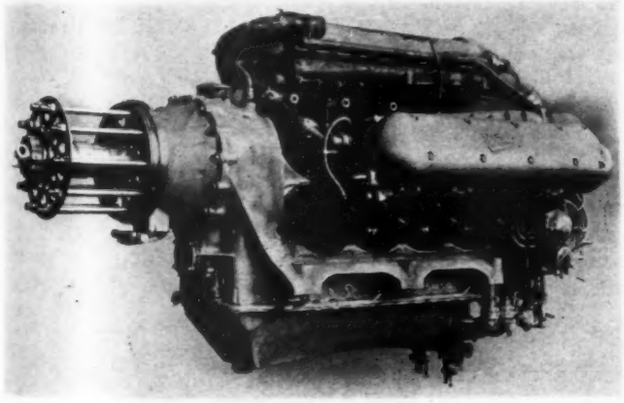
In the next four years, the number of manufacturers increased to 75 and the number of models to 160. There was still no definite trend of development with the possible exception of the increase in the relative number of

rotary engines, this type being exceeded in number of models offered only by the vertical in-line engines. The average horsepower, displacement, and speed were greater than in 1910.

With the advent of the World War the normal development was entirely upset. The necessity of getting planes to the front as rapidly as possible naturally tended to cause concentration on those types which appeared to offer the least number of obstacles in development. Experience with automobile engines undoubtedly had its influence in the concentration of effort at the start on water cooled types in preference to air cooled, with the exception of the rotary engines. None of the Allies had settled on any definite form and as a result all forms appeared. The Germans, on the contrary, had apparently decided on the six-in-line water cooled and concentrated their efforts on this type with wonderful results.

Due to the fact that in 1914 the rotary engine was considerably lighter in lb. per hp. than any of the other types, it predominated in the Allied machines at the start of hostilities. The limitations of this type were realized, however, and the stationary cylinder types were rapidly developed and soon reached the point where their performance exceeded that of the rotaries. The demand was constantly for greater powers. The 90 and 100 hp. rotaries of the start of the war had given way to 200 and 300 hp. engines when we joined the Allies and the end of hostilities found units of 900 to 1,000 hp. under development.

Predominant in this development during the war was the 12 cylinder water cooled "V" and the weight per horse power of this type was brought down to 2 lb. Modifications of this type having three or four banks of cylinders were developed to give equal performance, but the number of firms constructing these types was limited. The English foresaw the possibilities inherent in the air cooled radial engine and, at about the time of our entry, its development was pushed by that government. At the same time C. L. Lawrance was starting the work in this

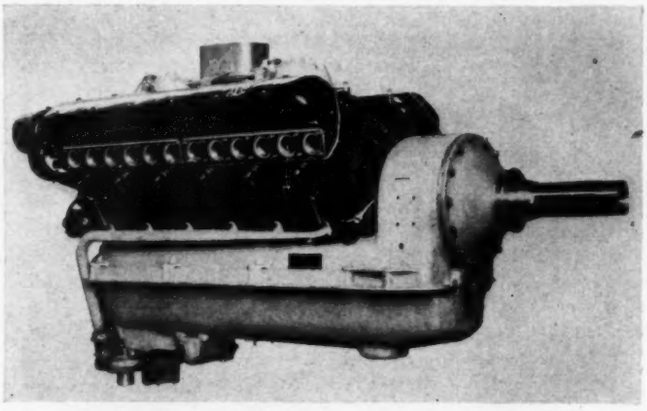


Front quarter view of a 530 hp. Napier "Lion" Series XI water cooled engine.

country which led up to the present Wright "Whirlwind" engine. In France, the development of the Anzani engine was continued.

Subsequent to the War, the trend toward the air cooled radial engine persisted. It was more or less an uphill fight for the adherents of this type of engine and many of the leading engineers were, one might say, violently opposed to it. Those who have been associated with the industry since the War will undoubtedly recall that quite a number of engineers, who are now singing the praises of the air cooled engine and broadcasting its many advantages, were not so long hence decrying it with equal vehemence. There were, therefore, a number of very successful water cooled developments before the general race to the air cooled standard set in, and there are still a number of eminently successful builders who have not yet deserted the type which helped so greatly in the winning of the War. It is quite possible that they never will.

As stated in the first paragraph, the entire development of the aviation engine has been devoid of radical changes. The improvement accomplished in weight per horse power has been accomplished in three ways, first, by development of better materials; second, by increasing the mean effective pressure; and third, by better disposition of the material. The improvement in endurance can be attributed partly to the first and last items mentioned above, but the greatest factor has been the training of the pilots.



A 600 hp. Curtiss geared "Conqueror" water cooled engine.

Taking these factors in the order listed, material comes first and rightly so. It is probably the greatest factor of all. The increase in strength of materials per pound of weight has been utilized mainly to withstand the increased stresses due to higher speeds and higher mean effective pressures. This is clearly evidenced by the figures in Table I giving weights per cu. in. displacement for the past 18 yr. These figures are not averages, but are taken from successful engines of each period. They cannot be said to be representative because in no period was there sufficient uniformity of design to say that any single engine was representative of the others. However, the figures do show that successful engines of today weigh just as much or more than did their predecessors in lb. per cu. in. displacement. The table is also of interest in showing the relative weights per cu. in. of the various types.

Table I.

Weight Displacement Ratio
Lb. Per Cu. In.

	1910	1914	1917	1922	1928
Radial	.65	.48	.50	.44	.48
Rotary	.34	.30	.33	.37	..
Vee	.66	.60	.62	.51	.60
Vert.	.62	.75	.59	.71	..

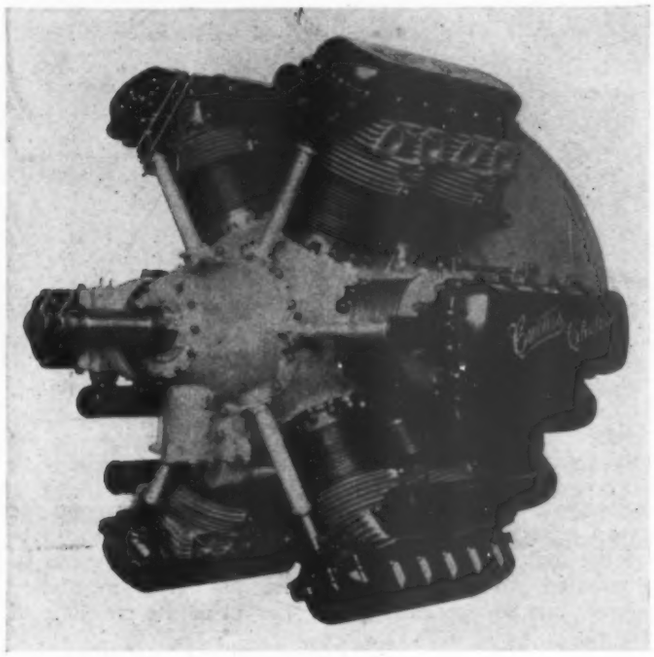
Table II shows a more definite advance but again it will be noted that the increase in speed is not uniform. This is characteristic of all of the tables and is due to the non-uniformity of design previously mentioned. The increase in speed with the coincident increase in mean effective pressures was made possible mainly by the improvement of materials but, undoubtedly, the third factor of better disposition of material aided. It is interesting to note that the speed of the rotaries did not keep pace with the other types and this is partly responsible for

their demise. The centrifugal force stresses limited the speed of this type.

Table II.
Speed in R.P.M.

	1910	1914	1917	1922	1928
Radial	1400	1200	1320	1500	1900
Rotor	1200	1200	1200	1300	....
Vee	1400	1200	1450	1700	2250
Vert.	1100	1300	1250	1400	....

The second factor, higher mean effective pressures, is shown in Table III. The increases shown were accomplished by improvement in volumetric efficiency and increase in compression ratio. The former was attained by



Front quarter view of a 660 hp. 12 cylinder Curtiss "Chieftain" aircooled engine.

improvements in manifolding and by increasing the valve diameters. The increase in compression ratio was made possible by improvements in cumbustion chamber shapes and cylinder cooling. The inability to secure adequate cylinder cooling in the air cooled engines held them back for some time as will be noted in the data for 1922, but the present types are now able to hold their own with their water cooled contemporaries. The improvement in mean effective pressures is even greater than is indicated by Table III, as these increases were attained in the face of increasing speeds.

Table III.
Mean Effective Pressures
Lb./Sq. In.

	1914	1917	1922	1928
Radial	87	79	91	125
Rotary	66	74	90	...
Vee	99	114	112	134
Vertical	102	104	125	...

The results of the increases in speeds and mean effective pressures are shown best in the values of power per cu. in. displacement shown in Table IV. In view of the fact that there was little decrease in weight per cu. in. displacement, the decrease in weight per horsepower shown in Table V was only accomplished by this increased cylinder performance. It will be noted that the particular air cooled radial and water cooled "V" engines chosen for 1928 show better cylinder performance for the water cooled engine, but that this is exactly offset by the lower weight displacement ratio of the radial.

Table IV.
Power Displacement Ratio
B.Hp./Cu. In.

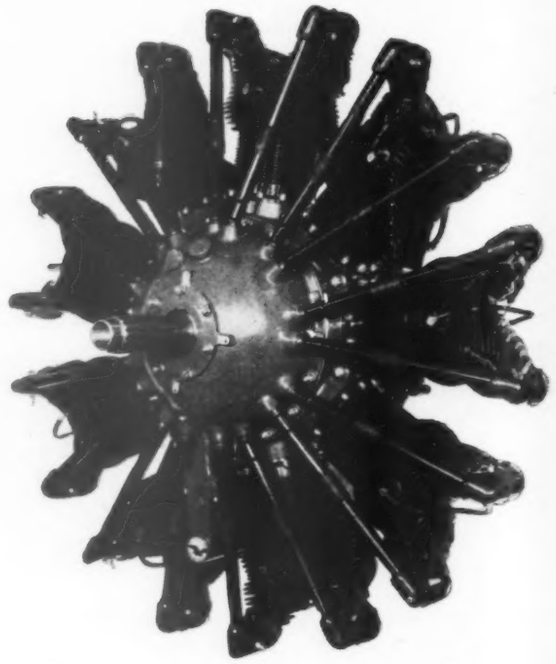
	1914	1917	1922	1928
Radial	.1313	.132	.171	.30
Rotary	.1002	.127	.148	..
Vee	.15	.209	.242	.38
Vertical	.154	.164	.222	..

Table V.
Weight Power Ratio
Lb./Hp.

	1914	1917	1922	1928
Radial	3.7	2.59	2.6	1.6
Rotor	2.97	2.60	2.1	..
Vee	3.81	2.97	2.1	1.6
Vertical	3.51	3.6	3.2	..

The advances due to better distribution of metal can not well be gauged, and it is only a personal opinion that the magnitude of this gain is relatively small. Undoubtedly, our knowledge of stresses has been increased, mainly by failures, and we have profited thereby. However, it must not be forgotten that the general form of our present engines does not differ from those of previous years. The radial probably offers the best opportunity for economical distribution of metal and it should be recalled that one of the first two engines, the Manly, was a radial and weighed but 2.4 lb. per hp. with the low mean effective pressure of 81 lb. per sq. in. and the low speed of 950 r.p.m.

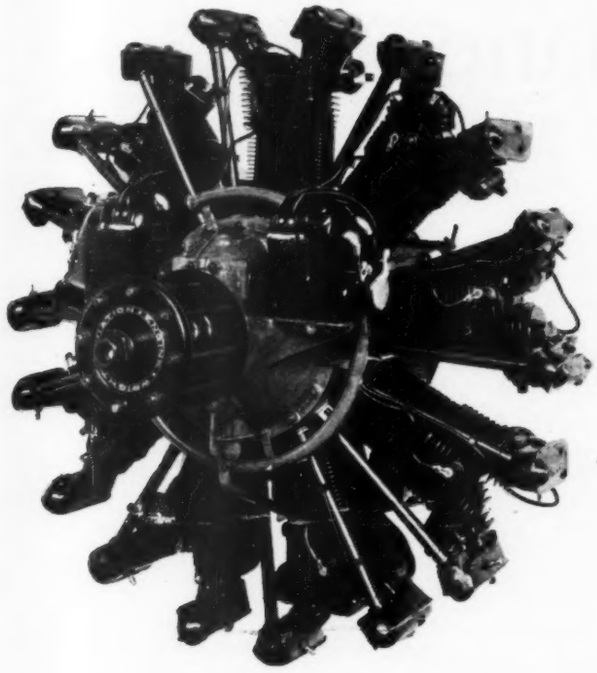
There is one additional factor in the accomplishment of decrease in specific weight, which I have not mentioned directly, but which deserves attention. That is the gradual increase in unit power that has occurred.



Front quarter view of a Pratt & Whitney Series B 450 hp. engine.

From an average of about 55 hp. in 1910 we now have an average of about 400 hp. (This is for military engines. I have not included commercial engines in any of this survey due to their comparatively recent advent.) The proportion of the weight decrease that can be ascribed to this increase in unit power is difficult to estimate and is probably generally over rather than under rated. Instances of increase in specific weight with increase in unit power are not uncommon.

Of the factors influencing the endurance of the engines, by far the most important is the very great change that has been accomplished in the handling of the engines in the air. Part of this is due to the better plane performance that permits of safe flying at much less than the maximum power available. The rest is due to the better understanding of the engine on the part of the pilots. Even as recently as the period at the end of the



Front quarter view of a 200 hp. Wright "Whirlwind" engine.

War, it was very difficult to get the pilots to use discretion in their manipulation of the throttle. It seemed that they just had to open the throttle with a bang and close it in the same way. And in the air full power seemed to be essential. The records that are now being made are being made with the engine throttled to 75 per cent. of its maximum power, or less, and the throttle is being manipulated with the utmost care. Although I do not have figures available on which to base an estimate, nevertheless, I venture to say that the records now being made would be cut to one-half, or less, if the engines were subjected to the severe service characteristic of the war period.

Credit to Engineers

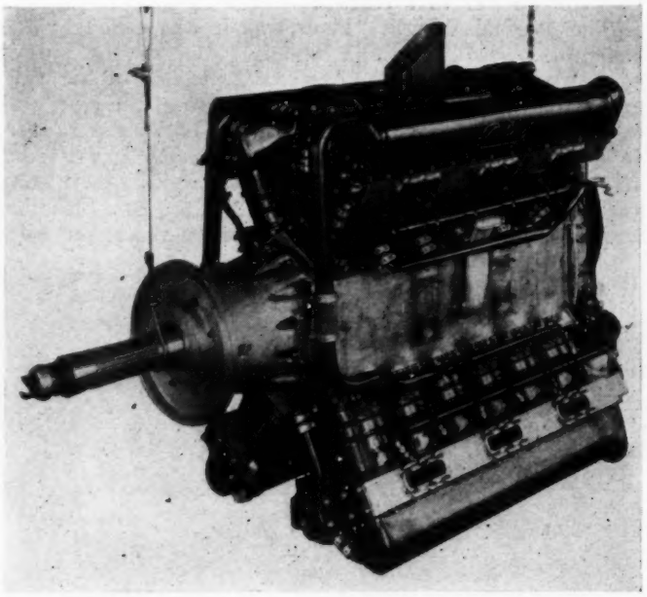
All of the credit, however, does not belong to the pilot, or the ground service. The engineers have done their share in making possible 300, 400, or even 500 hr. between overhauls in contrast to the 10 hr., 25 hr., and 50 hr. periods necessitated in war days. I have in mind one war model, which during the War required a top overhaul after the first 20 hr. of service. This engine was developed to the point where it succeeded in running 250 hr. at full throttle without a major failure or top overhaul. Post war engines have also been subjected to, and have passed successfully, endurance tests at full throttle for periods of over 100 hr.

In several places I have stated that there have been no radical advances in the development of the past 25 yrs. Undoubtedly, there will be some who may take exception to this with the knowledge of some special types. It is advisable, therefore, to mention that turbins of one sort or another, barrel engines, and cam engines have been with us throughout almost this entire period. However, there is one exception and one that I confidently expect to be the greatest single step forward.

During this year the Packard Motor Co. has announced its entry into the field of auto-ignition aviation engines under the able leadership of Capt. L. M. Woolson. On the West Coast, the Emsco Company has been formed and will be guided by an engineer eminently qualified by experience for this task, L. W. Griffith. A number of other reputable concerns, some of them constructors of heavier Diesel engines, have entered the field. In England, the Beardmore oil engine is being developed for the new dirigible, and rumor has it that the Bristol Company has under way an air cooled radial oil engine.

History to Be Duplicated

The history of the air cooled engine, in my opinion, is going to be duplicated, but with even more astounding results. The air cooled engine was known before its entry into aviation and at the start was not particularly successful. Insurmountable obstacles were seen by eminent engineers. Automobile experience was arrayed in the battle front. But some way or other these insurmountable obstacles either disappeared, or were surmounted. The Diesel engine has been known for years. Automobile experience can again be and is being marshalled to assail its appearance in the aviation industry. Even Diesel engineers say it cannot be done. Many have



A 24 cylinder 1250 hp. Packard "X" water cooled engine.

said that the ratio of mean effective pressure to maximum pressure is too low in comparison to the Otto cycle. This statement has already been refuted. For equal efficiencies the ratio can be made better for the Diesel than for the Otto cycle. And lastly, a thought worth much consideration, the Diesel engine can and is being successfully used in two-stroke cycles.

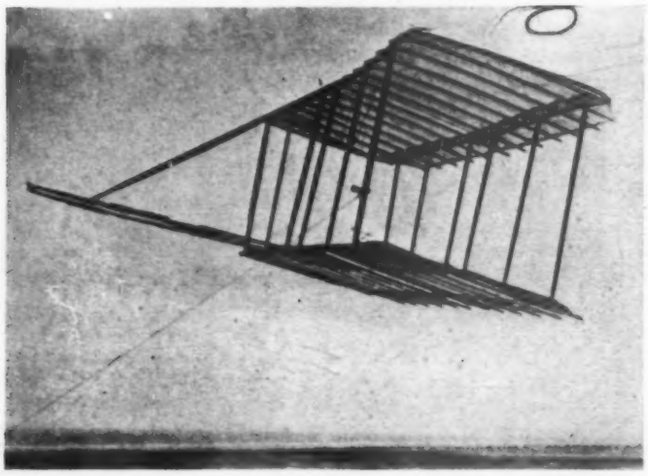
This is the first and only radical development in all of the 25 yrs. of aviation. Let us all welcome it and give it the encouragement that it deserves, but has not received.

The Original Wright Biplane

By Leslie E. Neville

THE first successful engine propelled airplane, flown by Orville and Wilbur Wright, on December 17, 1903, was a development of the Wright glider of 1902 and the result of a long series of experiments in aerodynamics and thousands of gliding flights. Several structural details of the 1902 glider were modified, however, in the power driven machine, to produce a stronger plane and to provide mounting for the engine. During the five years following the first flight, no fundamental changes were made in the original airplane and as a result, the Fort Meyer machine, built in 1908 bore a striking resemblance to the historic airplane. Unfortunately, the original plane was seriously damaged by a strong wind on the day of the first flights making it necessary to suspend experiments for that year.

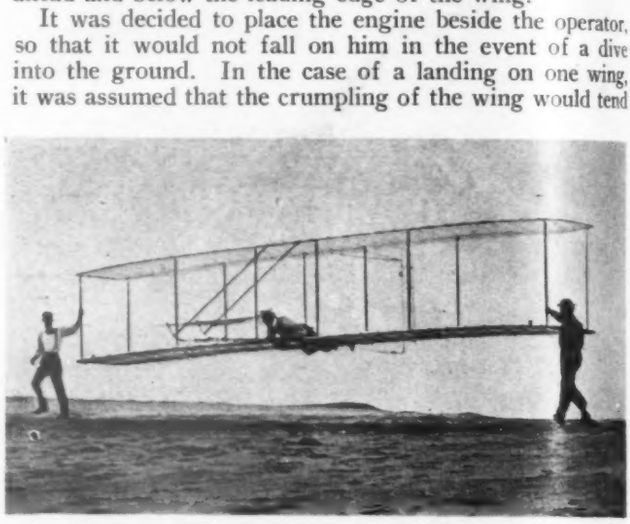
The original Wright "Flyer," as it was called by the inventors, was a modified biplane glider of the pusher type, having two propellers placed at the rear of the wing structure. A double vertical rudder, also at the rear, was supported on outriggers and a double horizontal rudder, or elevator, similarly supported, was located at the front of the machine. Runners or skids were used in the undercarriage to reduce the length of the landing run. Engine, radiator and fuel tank were mounted on the lower wing



Type of kite used by the Wright brothers in their early experiments in controlled flight.

at the right of the longitutional center line so as to balance the weight of the operator on the left. In the original plane the operator lay face downward on the wing to decrease wind resistance, but this feature was changed in the later Wright planes and provision was made for pilot's and passenger's seats on the wing, so that the occupants sat with their feet braced against a wooden rest placed ahead and below the leading edge of the wing.

It was decided to place the engine beside the operator, so that it would not fall on him in the event of a dive into the ground. In the case of a landing on one wing, it was assumed that the crumpling of the wing would tend



Action picture of a Wright experiment with a glider in 1902.

to absorb the shock, and little danger to the operator was expected from this source. To preclude the possibility of nosing over in a landing, the runners were extended for a considerable distance in front of the wing structure.

The historic plane had a wing span of 40 ft., 4 in., a chord of 6 ft., 6 in., and an overall length of 19 ft., 9 in. A gross weight of 550 to 600 lb. was allowed in the design of the first plane, but this was increased to 750 to 800 lb. after the engine was completed and was found to develop greater power than originally expected. In the first flight, which lasted but 12 sec., the speed of the machine relative to the air, was 3.6 m.h.p. Four flights were made with the airplane, and the longest was of 59 sec. duration. A distance of 852 ft. against a wind of approrimate 20 m.h.p. was covered in this flight.

Great difficulty was experienced by the Wright Brothers in obtaining a suitable power plant for their machine. After communicating with a number of gasoline engine manufacturers, the internal combustion engine then being in its infancy, the brothers decided to build their own power plant. After the design work was completed, it required just six weeks to build the engine. This first airplane power plant was a water cooled, four cycle, four cylinder in line vertical type having a bore of 4 in. and a stroke of 4 in., and weighing less than 200 lb. Preliminary block tests on the engine showed that it developed approximately 9 hp. These tests, however, were made

over periods of one or two minutes at a time with inadequate provision for lubrication. Later it was found that the engine would develop 16 hp. for a few seconds after starting, but that the output dropped rapidly until, at the end of a minute, it was only 12 hp.

Believing it to be desirable to displace as large a volume of air as possible and to permit the use of greater pitch, it was decided to use two propellers. Opposite rotation, to neutralize the gyroscopic effect, was accomplished by means of a double chain drive system in which one chain was crossed and the other used in the normal manner. The first propellers, which were built entirely on the basis of theoretical calculations and without the benefit of previous experience with airscrews, were about 66 per cent. efficient. This was one of the contributing factors to the success of the plane. In later Wright planes a propeller efficiency of 78 per cent. was obtained.

Adopt Solid Propeller Shaft

After a series of tests with tubular propeller shafts, during which several were broken, this idea was abandoned and solid tool steel shafts of smaller diameter than the tubes were substituted. This was made necessary because of the irregular operation of the engine which had a flywheel too light to protect the transmission system from the sudden shocks resulting from the frequent miss firing, or premature explosions. Mounting struts for the propeller shafts were located between the wings. A number of flat copper tubes placed vertically and extending the entire distance between the wings, constituted the radiator.

Hard rubber tire cement was used to secure the lock nuts on the socket ends of the propeller shafts. This was resorted to after the failure of various attempts to prevent the nuts from coming loose. The shafts and sprockets were heated, and melted cement was poured on the threads. The nuts were then screwed in place and no further difficulty was experienced with them.

The wings were constructed of wood and covered with fabric. Metal fittings were used in assembling the structure. Two spars were used, the forward member constituting the leading edge and the rear spar being located approximately two-thirds of the chord distance from the leading edge. Former ribs consisted of two wooden strips about ¼ by½ in. bent to the camber of the wing and having wooden blocks placed at intervals between them. Solid compression ribs were provided at several points, including the station containing the engine mounting and operator's position.

The wing curve, which was developed after a long series of wind tunnel tests with various airfoil shapes, was

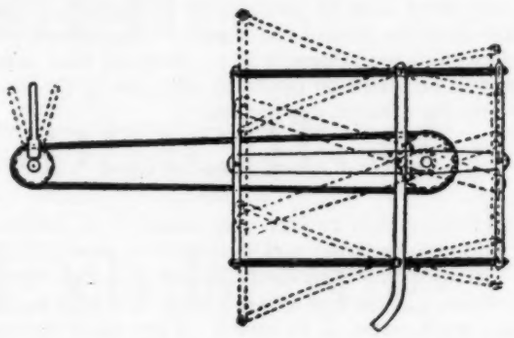
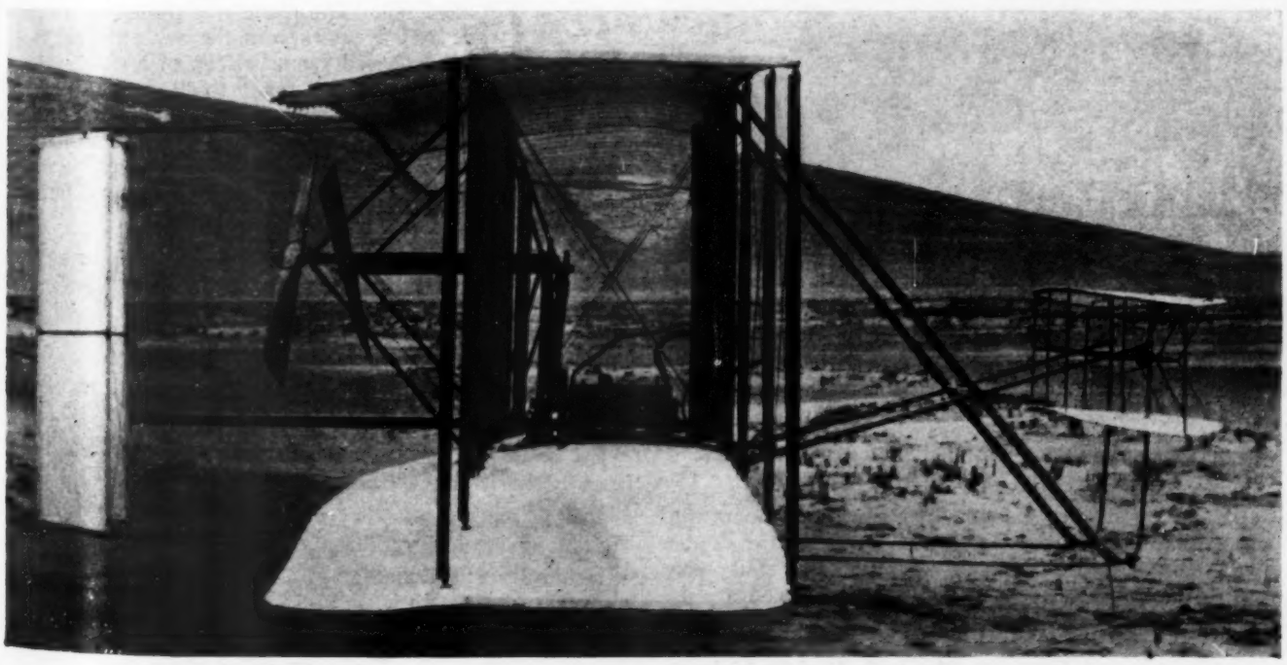


Diagram showing the operation of the flexible rudders and elevators of the original Wright Biplane.

parabolic with the chord very long in proportion to the focal length. This curve was adopted after making tests on a large number of surfaces of different shapes, and measuring effects of air pressure on many standard surfaces at various angles of attack. Wings were built in the form of an arch from tip to tip to maintain lateral stability.

To control lateral stability a means was provided for warping the after portion of the tip section in such a way as to vary the camber at the tips. In the original plans, the warp and rudder action was controlled by a universally pivoted lever which, when moved laterally actuated the warp and when moved in a fore and aft direction, controlled the rudder. A diagonal motion of



Side view of the Wright Biplane, the first successful heavier-than-air craft.

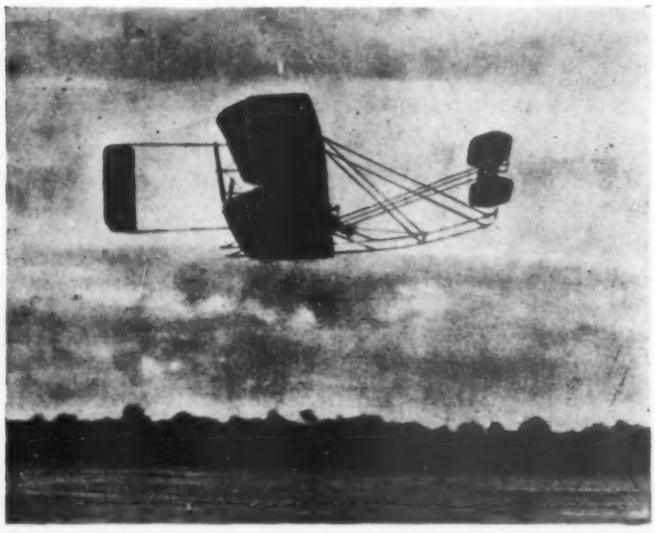
the lever moved both rudder and warp simultaneously, producing a compound control effect. This combined action of rudder and warp was the subject of a basic patent obtained by the Wright Brothers. The horizontal rudder, or elevator, was controlled by a separate lever.

Vertical interplane struts and diagonal truss wires were used in the external bracing. The struts were attached by metal fittings to the wing spars and rigid wire bracing was used between all the forward struts. This bracing was employed between the rear struts of the central bays. The rear struts of the two outer bays were not rigidly braced, but were held in position by means of the moveable wires used to control the warp. These wires passed over pulleys and the system was so designed that opposite warping was obtained on opposite sides, as in the case of the ailerons on present day planes.

Double Vertical Rudder Used

The double vertical rudder was placed 4 ft. behind the trailing edge of the wing and mounted on pivots between two "V" shaped outriggers, one at the top and the other at the bottom. The rudders were both 7 ft. high and 2 ft. wide, and were placed 2 ft. apart. They were rectagular in shape, constructed of wood and covered with fabric. Similar construction was used in the horizontal rudders, or elevators, which also were double and pivoted to their mounting members at a line 7 ft., 3 in. in front of the leading edge of the wings. The elevators had a span of 12 ft. and a chord of 2 ft., 6 in., constant throughout the greater portion of the span and decreasing to zero at the pointed tips. The elevators were mounted on two members formed by bending the landing rudders to a vertical position. The runners were braced near the bend by two struts attached to the leading edge of the upper wing.

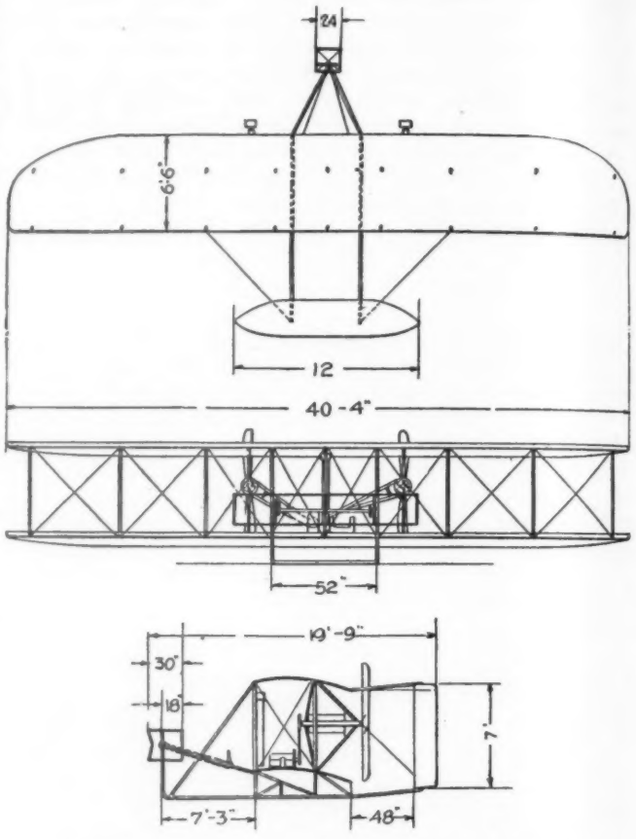
One of the outstanding characteristics of the Wright biplane was the use of flexible rudders and elevators. It was thus made possible to present cambered instead of



An action picture of an early type of Wright Biplane in which Wilbur Wright flew in France during 1908.

flat surfaces to the air against which they were operating. When actuated by their respective control bars, the double rudders and elevators did not merely pivot but were sprung into a curved form. This effect was produced by eccentricity between the pivotal points of the surfaces and the pivots of the actuating bar between them. This also was a patented feature in the early Wright biplanes.

One of the interesting features of the Wright biplanes was the manner in which they were launched. The use of landing runners made it impossible for the plane to take-off from the ground even if the engine had developed sufficient power, which of course it did not. In order to attain flying speed the machine was placed on a monorail



Three-view drawing of the original Wright Biplane.

track consisting of a series of planks placed on edge and bearing a thin steel rail. The plane was placed on a small car on the track and a cable from the car attached to a weight which was released from the top of a small portable tower when the plane was ready to start. The falling weight imparted sufficient velocity to the plane to enable it to attain flying speed when it reached the end of the rail. It was not until a number of years after the first flight at Kitty Hawk that wheels were substituted for the runners on the Wright airplanes.

The specifications of the first Wright biplane are as follows:

Wing span	40 ft., 4 in.
Chord	6 ft., 6 in.
Overall length	19 ft., 9 in.
Approximate height	7 ft.
Wing curve	Parabolic
Span of horizontal elevators	12 ft.
Chord of elevators	2 ft., 6 in.
Height of vertical rudders	7 ft.
Width of vertical rudders	2 ft.
Landing gear tread	4 ft., 4 in.
Engine	Four cylinder in line developing 12 hp.
Drive	Twin propeller chain and sprocket

Brief Histories *of the* Development *of* Companies Exhibiting

at the

INTERNATIONAL AERONAUTICAL EXPOSITION

CHICAGO, ILL.

December 1-9, 1928

A C Spark Plug Co.

A C Spark Plug Co., which was organized in 1908, entered the aeronautical industry some 16 years ago when it first began the manufacture of spark plugs for aviation engines. With the entrance of the United States into the World War and with the resultant increase in the demand for aircraft engines and accessories, the company immediately went into production on its aviation spark plugs. Production of these plugs, which were used extensively in Liberty, Wright and Hispano-Suiza engines, was increased continually throughout the war period, and shortly before the Armistice was signed, the company was producing more than 50,000 plugs a day, according to officials of the firm.

The A C company is now manufacturing tachometers, oil pressure gauges, oil temperature gauges, fuel pumps, ammeters and instrument board panels, in addition to its line of spark plugs. Production of these instruments, which are supplied to the automobile and motor boat industries, as well as the aeronautical industry, are said to be in excess of 35,000 a day. The complete line of spark plugs and aircraft instruments is on display in the company's exhibit this week at the Chicago aircraft show.

The officers of the company are B. W. de Guichard, president and general manager; H. H. Curtice, vice-president and assistant general manager; Taine G. McDougal, vice-president and W. S. Isherwood, general sales manager. Joseph Zubatny is chief engineer and Hector Rabezzana, chief spark plug development engineer. The headquarters of the concern are located in Flint, Mich.

The Advance Aircraft Co.

The Advance Aircraft Co., manufacturer of Waco airplanes, Troy, O. was organized in 1919, and is one of the oldest makers of commercial aircraft in the United States. It is an outgrowth of the Weaver Aircraft Co., which was operated by "Buck" Weaver, E. J. Junkin, C. J. Brukner and Nelson Foote for several months before the organization of the Advance company. With the formation of the new company, Mr. Junkin became president; Mr. Brukner, treasurer; and Mr. Foote, clerk.

The name for the line of planes manufactured by this concern was coined by using the initial letters of the words, "Weaver Aircraft," and the abbreviation of the word "company." With the organization of the Advance Aircraft Co., production of the "Waco" three passenger open cockpit biplane was started. As the demand increased for this model, which is perhaps one of the best known American commercial types, production has been increased. Improvements, likewise, have been incorporated from time to time. Officials of the company boast that more commercial airplanes have been turned out by its factory than from any other in the United States.

The Advance company is now headed by Mr. Brukner. With him at the helm are Lee N. Brutus, vice president; and L. E. St. John, secretary. The company is exhibiting a complete line of Waco planes at the show.

Aerial Service Corp.

The Aerial Service Corp., manufacturer of Mercury Aircraft, was organized in 1920. The factory is located at Hammondsport, N. Y. The officers of the firm are Henry Kleckler, president; W. C. Chadeayne, vice-president; H. Y. Rose, secretary-treasurer; H. C. Mummert, chief engineer and designer, and J. F. Meade, general manager.

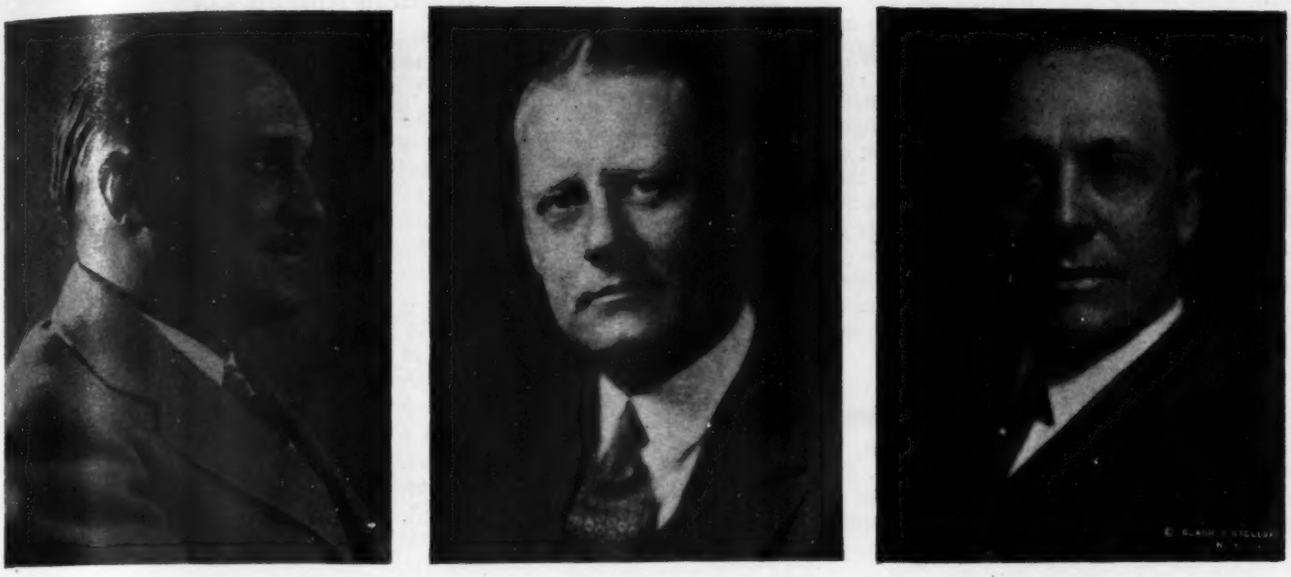
The company, in addition to the lighter-than-air equipment it has designed and manufactured for the Army and Navy, has designed and built two different types of mail planes, the "Aerial Mercury" and the "Mercury, Jr." It has also designed and built the "Mercury Standard," a five place open cockpit passenger carrying biplane. The "Mercury Kitten," a three place cabin monoplane, is the latest development of the Aerial Service Corp. This plane is on display in the Coliseum in Chicago.

Aero Guides, Inc.

This company, which manufactures "Aero Guides" as the name implies, is a little less than a year old. It was organized last February with R. B. Bevier as president, C. F. B. Roth, executive vice-president; K. M. Bevier, treasurer, and H. T. Parsons, secretary. The headquarters of the firm are located at 54 Franklin St., New York, N. Y.

The company is a subsidiary of BeVier and Co., which

Left to right: B. W. de Guichard, president, A C Spark Plug Co.; C. J. Brukner, president, Advance Aircraft Corp.; H. C. Mummert, chief engineer Aerial Service Corp.



Left to right: J. Don Alexander, president, Alexander Aircraft Corp.; Stedman Hauks, president, American Airports, Inc.; Inglis M. Uppercu, president, Aeromarine Co.

has acted as a manufacturers' representative to the Army, Navy and Marine Corps for the last four years. One of the interesting features concerning the Aero Guides company is the fact that its entire personnel is made up of men who have seen service with the Army and Navy.

The Aero Guides produced by this concern won the highest award at the 1928 National Airway Marking Conference, held in Wichita, Kan. The company is exhibiting these markers, as well as a model landing field, in its booth.

Aeromarine Klemm Corp.

The Aeromarine Klemm Corp. is one of the newcomers in the aeronautical field. This firm was organized in June of this year. However, Inglis M. Uppercu, president of the organization, has been active in the industry since 1908. The company is exhibiting two of its Aeromarine Klemm airplanes at the International Aeronautical Exposition in Chicago.

The executive offices of the Aeromarine Klemm Corp. are located in the Paramount Building, New York, N. Y., while the factory is in Keyport, N. J. Besides Mr. Uppercu, the officers of the company are Wm. H. Douglas, vice-president and general manager, John German, secretary, James Wright, treasurer, and H. Allen Sullivan.

Aeronautical Products Corp.

Aeronautical Products Corp. was organized May 1, 1928, at Naugatuck, Conn. This firm manufactures the "Scorpion," a four-cylinder, vertical, air-cooled engine. The firm was organized by several engineers for the purpose of building a light, compact air-cooled engine to take the place of the fast-diminishing surplus of war-time engines.

The concern is located in a modern factory and machinery has been intsalled, which will allow the production of a great number of these engines.

A "Scorpion" four-in-line, 100 hp. air-cooled engine is attractively displayed at the Aeronautical Products Corp. booth at the Chicago show.

The present officers of the company are H. Alex Johnson and Harris J. Wittemore, Jr. The offices are at Naugatuck, Conn.

Aero Supply Manufacturing Co.

G. I. Stich, who has been known to the aero industry since 1921, organized, in 1923, the Aero Supply Manufacturing Co., Inc., for the purpose of manufacturing every sort of screw product used in the construction of aircraft. This company was re-organized in 1925 and moved to its present quarters at College Point, L. I., in January, 1926. All the products manufactured by the company are built to Government specifications, and have now been standardized by many aircraft manufacturers in this country.

The Aero Supply Company is exhibiting at the Chicago show its varied line of screw products and photographs of various planes equipped with these products.

Mr. Stich is president of the company.

Aire-Kraft, Inc.

The Cabin-Aire monoplane being exhibited at Chicago, is the product of Aire-Kraft, Inc., a company which was organized on May 25, 1928. DeLloyd Thompson, pioneer exhibition aviator, is sales manager for the company and is in charge of the booth.

At the present time the firm is doing experimental work at Dayton, O. However, according to a statement issued by the executives, it will locate and go into production at Washington, Pa., the first part of the coming year. Executive offices are at present maintained at Washington, Pa. C. E. MacGinnis is president of the concern; J. M. Deal, vice-president; Charles M. Brown, secretary and treasurer, and O. H. Snyder is chief engineer.

Alexander Aircraft Co.

Alexander Aircraft Co., manufacturer of the Alexander Eaglerock biplanes, was organized in 1925 with headquarters at Denver, Colo. The original officers were J. Don Alexander, president; Don M. Alexander, vice-president, and R. A. Duncan, secretary-treasurer. Following the organization of the company, production was started on the Alexander long and combination wing Eaglerocks, which were well received.

The continued increase in the demand for the Alexander planes finally necessitated an enlargement of the manufacturing facilities of the company. As a result,

plans were drawn up, contracts were let, and the buildings for a new factory were erected on a site which had been secured at Colorado Springs, Colo. The company moved into its new quarters this year.

The Alexander company is now manufacturing the center section Eaglerock, a three passenger, open cockpit biplane which is on display at the exhibit of the company.

The present officers are the same as the original ones. In addition, however, J. A. McIaney has joined the group of executives as a vice-president in charge of sales. These men are responsible for the introduction of a number of features in the manufacture and merchandising of Alexander planes. One of the most noteworthy accomplishments is the institution of a system for selling the planes on a time basis.

Aluminum Company of America

On Sept. 19, 1888, the Pittsburgh Reduction Co. was incorporated by Chas. M. Hall, Alfred E. Hunt and Arthur V. Davis. The firm was originated, as the name implies, to manufacture aluminum and its products. On Jan. 1, 1907, the name was changed from the Pittsburgh Reduction Co. to the Aluminum Co. of America, which change was in name only. The Aluminum Co. of America has been in the aeronautical field ever since aluminum was first used in the construction of aircraft engines and planes, and it furnishes aluminum in every conceivable form to the aircraft industry today. It now manufactures and furnishes, among many others, the following parts: cowling, fuselage frame, sheet aluminum for fuselage covering, channels, fabricated structural shapes, angles, gusset plates, bronze powder, throttle hand controls, crank pieces, cylinder heads, pistons, connecting rods, valve housings, manifold intake, ignition wire tubes, super-charger propellers, seats and chairs, rivets and screw machine parts.

A comprehensive display is exhibited at the Chicago Show.

The present officers are Arthur V. Davis, chairman of the Board; Roy A. Hunt, president; R. E. Withers, vice-president and treasurer; Geo. R. Gibbons, vice-president in charge of sales; Geo. J. Stanley, general sales manager; and Harwood Byrnes, assistant general sales manager. Executive offices and plant are at Pittsburgh, Pa.

American Airports Corp.

Designing, developing and managing airports was the ambitious program which lay behind the formation of the American Airports Corp. Stedman Hanks, the president of the concern, has been the head of his own banking and brokerage firm, but also has always been keenly interested in the developments and growth of aeronautics. Surveying the field from the business viewpoint, it seemed as though the problems of airport management were sufficiently similar throughout the country to make worth while the organization of a company specializing in this business.

American Airports was incorporated Jan. 6, 1928, and offices were opened at 527 Fifth Ave., New York. Beside Mr. Hanks, the officers of the company are Martin Dodge, secretary and vice-president; Guy George Gabrielson, treasurer, and John F. O'Ryan, special counselor. During this year, the firm has been engaged by 33 cities and companies to do various phases of the work connected with the development and management of new airports. Among these are Flint, Philadelphia Air Terminal, Inc., the City of Newark, Poughkeepsie, Springfield, Lowell and Pinehurst.

The company is exhibiting a model of an airport at the show, and also drawings and plans for hangars, field, etc.

American Cirrus Engines, Inc.

American Cirrus Engines, Inc., New York, N. Y., is a new firm organized to manufacture and merchandise the Cirrus Mark III, four cylinder, vertical, air cooled engine in the United States. The formation of the new company is the direct result of the purchase of the exclusive American sales, manufacturing and distribution rights for the popular British power plant by a banking syndicate headed by Campbell, Peterson and Co., 84 William St., New York. R. Potter Campbell, chairman of the board of directors of the Campbell, Peterson company, is president of American Cirrus Engines, and A. C. Hoffman is the vice-president of the new concern.

Several Cirrus engines of the Mark III type are on display at the booth occupied by American Cirrus Engines, Inc., at the International Aeronautical Exposition being held in Chicago, this week.

Left to right:—L. H. Atkinson, vice president, Atkinso n Aviation Co.; E. E. Porterfield, Jr., president American Eagle Aircraft Corp.; G. F. Ahlbrandt, gen. mgr. of sales, American Rolling Mill Co.

Left to right:—W. G. Treiber, sales manager, BBT Corp.; William E. Arthur, mgr. Airport Division, The Austin Co.; Jule C. Axelson, president, Axelson Machine Co.

In conjunction with this display, Air Associates, Inc., well-known New York aeronautical house, which has the sole distribution rights in the United States for the Avro "Avian" light plane, is exhibiting the famous Avian used by Lady Heath in her long distance solo flights. This plane is powered with a Cirrus Mark II engine. In addition, the company is making daily demonstrations at the Chicago Municipal Airport with an Avian, equipped with the Handley-Page slotted wings, and powered with a Mark III engine.

Aviation Protection, Inc., an insurance company with headquarters at 110 William St., New York, is also exhibiting.

American Eagle Aircraft Corp.

American Eagle Aircraft Corp., airplane manufacturer with headquarters at 2800 E. 13 St., Kansas City, Mo., is exhibiting four planes during the show. Three of these planes are new products. They are a two passenger, folding wing, sport biplane; a two passenger, training service plane, and a cabin monoplane of the conventional type, which is designed to carry three passengers in addition to express or mail, or five passengers. Besides these three new planes, the company is displaying the three passengers, open cockpit biplane which has been in production for some time.

The American Eagle company was organized in April, 1925. The first 18 mo. of its existence were devoted almost entirely to experimental work. Production was finally started on a three passenger biplane. Increased demand for this plane soon made expansion of the manufacturing facilities necessary and in February, 1928, the company moved into larger quarters.

The manufacturing concern was re-organized last September and plans for an extensive program of expansion were inaugurated. This program included the erection of a new plant, now under construction, at the Fairfax Airport Kansas City, Kans. The factory will have a total floor space of 65,000 sq. ft. as compared with the present 25,000 sq. ft. of floor space contained in the present plant. The factory buildings and installation of equipment, it is expected, will be completed January 1, and production will be started immediately on all four types of American Eagle planes.

The present officers are E. E. Porterfield, Jr., president; E. L. Chick, vice-president; M. L. Anderson, treasurer, and Mord M. Bogie, secretary. Members of the board of directors include Barney Oldfield, famous automobile race driver, and Charles O'Toole, New York capitalist and aviation enthusiast.

American Rolling Mill Co.

The American Rolling Mill Co., manufacturer of iron and sheet steel specialties, with headquarters at Middletown, O., was organized in 1899. In the 28 yr. of its existence it has grown from an organization with an invested capital of $350,000, to one with capital of more than $115,000,000.

This growth is attributed by officials of the company to the service "Armco" ingot iron has rendered to industry. This product, which was introduced by the company over 20 years ago, has found a wide variety of uses. It is now used by the aeronautical industry in the construction of hangars, in the manufacture of gasoline tanks and for engine manifolds. It is also used extensively for drain pipe. In this form, it is finding a ready market among airport constructors. The various uses of the iron are being shown by the company this week in Chicago.

The officers of the American Rolling Mill Co. are George M. Verity, president; J. H. Frantz, first vice-president; Charles R. Hook, vice-president and general manager; W. S. Horner, vice-president; W. D. Vorhis, secretary; Calvin W. Verity, treasurer and assistant general manager; W. W. Sebald, J. P. Miller, J. B. Tytus, D. Eppelsheimer and Bennett Chapple, vice-presidents; Margaret Thompson, assistant secretary; C. W. Davis, assistant treasurer; M. A. Brawley, assistant treasurer, and F. B. Moore.

Atkinson Aviation Co., Inc.

The Atkinson Aviation Company, Inc., has just been incorporated at 406-412 Washington Street, Gary, Indiana. It is said to be training in excess of 100 students at present.

In addition to manufacturing wings and parts, the company is developing its own training planes. L. H. Atkinson organized the original school in November.

1927. The present officers are V. V. Young, president; L. H. Atkinson, vice-president and general manager; Mary Irwin, secretary and treasurer; C. N. Martin, chief engineer, and F. W. Morrow, service manager.

The firm is now planning to erect a school and shop building on its own airport. The officers of the firm will be at the Chicago Aircraft Show to explain to the public the equipment and method of training.

The Austin Company

The Austin Company, founded by Samuel Austin in 1878, and originally located at 1257 Broadway, Cleveland, O., entered the aeronautical field in 1917. This company engages in preliminary surveys, site selection and construction of complete airports, and the design, construction and equipping of hangars of all types and sizes up to a clear span of 200 ft.

The firm is featuring a lighted model of a complete airport in its exhibit, which also includes drawings and photographs of airports and airport buildings, wind tunnels and other structures for those engaged in the aeronautical industry.

W. J. Austin is the president and general manager; G. A. Bryant, Jr., vice-president and general sales manager, and C. W. Kinnison, secretary and treasurer. The headquarters of the firm are now located at 16112 Euclid Ave., Cleveland, O.

Axelson Machine Co.

The Axelson Machine Co. was founded in 1892. For more than a third of a century this firm has been engaged in the manufacture of precision machine tools, oil pumps and other mechanism. Today the company is offering a seven cylinder radial air cooled engine developing 150 hp. for use in airplanes.

In August, announcement was made by officials of the company that it had purchased the business of Frank L. Orenbreit, Inc., manufacturer of the "Floco" seven cylinder, radial air cooled engine, and that the entire pressure of the resources of the machine company were being placed behind the immediate production of the engine. At the same time the name was changed. The engine, which develops 150 hp. at 1,800 r.p.m., is now known as the Axelson. It is this engine, which is on display at the exhibit of the Axelson company in Chicago. Jule C. Axelson, president, and Fred Worthy, William Laury and Wilhelm Jadh, who are members of the factory staff of the machine company, are in charge of the display.

B. B. T. Corporation of America

The B. B. T. Corporation of America, producer of night flying equipment for airways and airports, was organized in August, 1924. C. Townsend Ludington and W. Wallace Kellett were the founders. The firm at first imported lighting equipment from France, but eventually began to manufacture equipment, with the exception of the dioptric Fresnel lenses which are still obtained from the French firm of Barbier, Benard and Turenne.

The products of this company are well-known. They were used to equip the first regular night flying route from Chicago to Cheyenee, Wyo., the night flying route from New York to Chicago, and are used on the Navy's aircraft carriers, the "Langley," "Lexington" and "Saratoga," according to officials of the firm.

The B. B. T. Corporation is located at 816 Atlantic Bldg., Philadelphia, Pa., and is headed by Mr. Ludington, who is president; Mr. Kellett, who is secretary-treasurer, and R. G. Kellett, vice-president. The company is exhibiting the Q-5 flashing beacon, AF floodlight, PF hangar floodlight, and the H-8-D intermediate air mail landing field floodlight at the Chicago show.

Balsa Wood Co., Inc.

The Balsa Wood Co., Inc., was organized March 1, 1925, with offices at 331 Madison Ave., New York, N. Y. The original officers were E. Howard Figg, president; Elmer J. Chambers, secretary and treasurer; and F. G. Samuels, assistant secretary. The company immediately entered the aero field by manufacturing streamline parts for airplanes.

Other of the products are model airplanes of Balsa wood, bumper blocks for packing radios, talking machines and furniture, diaphrams for radio loud speakers, insulation and isolation blocks, fillings for motor boat bilges, etc.

The firm is showing Balsa wood, airplant parts, models and novelties at the Chicago aircraft show.

An addition to the original officers is James F. Downey, general manager of the firm, which now operates at 158 Pioneer St., Brooklyn, N. Y., and 331 Madison Ave., New York, N. Y.

Left to right: E. Howard Figg, president, The Balsa Wood Co., Inc.; Vincent Bendix, president, Bendix Brake Co.; Guiseppe M. Bellanca, president, Bellanca Aircraft Corp.

Left to right: T. B. Colby, manager, aviation department, Berry Bros.; C. B. Bohn, president, Bohn Aluminum and Brass Corp.; P. G. Johnson, president, Boeing Airplane Co.

Bellanca Aircraft Corp.

The Bellanca Aircraft Corp. was organized on Dec. 31, 1927, at 3491 Richmond Terrace, Staten Island, N. Y. The original officers were G. M. Bellanca, president; E. M. Hoopes, Jr., vice-president and treasurer; and A. D. Chandler, secretary. Shortly after its organization the company started production of the Bellanca CH and K models. However, while not devoting its time exclusively to the Bellanca CH the firm has concentrated on the production of this cabin monoplane until now it is producing on the average of two a week and it has been announced by the officials that one plane a day will be the average production after the first of the coming year. A Bellanca CH six passenger monoplane, powered with a Wright Whirlwind engine, is on display at the Coliseum in Chicago.

Since the date of formation the company has moved its headquarters to New Castle, Del. G. M. Bellanca is still president while R. R. Redington is vice-president and Andrew Bellanca, secretary.

Berry Bros., Inc.

The firm of Berry Bros., Inc. was organized by Thomas Berry and Joseph Berry in 1858. The address of the company at that time was 211 Lieb Street, Detroit, Mich., and it is interesting to note that this varnish and paint manufacturing house still maintains its headquarters at the same address.

Berry Bros. first entered the aeronautical field in 1916 when it began selling airplane dope to the Allied nations in the World War. In 1918, the dopes manufactured by this concern as well as its varnishes, were adopted for use by the U. S. Army and Navy. In this same year, Berry Bros.' Lionoil was adopted by the French government for use in protecting duralumin. The aircraft business transacted by the concern had grown to such proportions in 1925 that a special aviation division was formed. This division is under the direction of Thomas B. Colby. In addition, the company now maintains a laboratory which is specializing in the development of aircraft finishes. It also has a special sales force to handle the aircraft business.

Aircraft "Berryloid," Lionoil, varnishes, dopes and allied products are now manufactured by the Berry Bros. house. The company is featuring motion pictures of the 1928 National Air Tour, color panels, and booklets on finishing at its exhibit. The present officers are F. L. Colby, president; W. R. Carnegie, manager; and George V. Blenkarn, treasurer. Thomas B. Colby is the manager of the aviation division and his assistant is T. A. Murphy.

Bendix Brake Co.

The Bendix Brake Co. was organized in 1924 to manufacture Bendix 4 Brakes for automobiles. The original officers were Vincent Bendix, president; Walter J. Buettner, secretary and treasurer.

The firm entered into the aeronautical field in 1927, making Bendix wheels and brakes for airplanes. The Bendix airplane wheels and brakes have been approved and accepted by the U. S. Army, the U. S. Navy and many of the well-known commercial aircraft builders.

The present officers are Vincent Bendix, president; Walter J. Buettner, secretary and treasurer; with John R. Cautley in charge of the Airplane Equipment Division.

General offices are at 401 Bendix Drive, South Bend, Indiana.

Black & Decker Manufacturing Co.

About 15 yrs. ago, Black & Decker Manufacturing Co. entered the automobile industry with the introduction of a line of production and service equipment. The products of the company have been increased gradually in number, and the line of equipment now includes production machinery, tools, tool kits, wheel brushes and portable electric tools of almost every description. The portable tools made by Black & Decker are on display in Chicago. The present officers of the company are S. Duncan Black, president; Alonzo G. Decker, vice-president and general manager; Charles J. Fox, second vice-president; Benjamin J. Ridgely, third vice-president; George M. Kimberly, treasurer, and Charles A. Sacra, assistant secretary. The headquarters of the company are in Towson,

Md. In addition, branch offices are maintained in Boston, New York, Philadelphia, Baltimore, Atlanta, Cleveland, Chicago, Kansas City, Detroit, Oakland, Buffalo, Minneapolis, Dallas, and St. Louis. Other branches are located in Canada and the British Isles.

E. W. Bliss Co.

E. W. Bliss Co., manufacturer of heavy machinery and presses, originated in 1857 as Bliss and Williams, a partnership formed between E. W. Bliss and J. H. Williams. A few years later Mr. Bliss purchased the interests of Mr. Williams. The present firm was incorporated about 28 years ago, and since that time has grown until it now has five factories in the United States, and is one of the largest manufacturers of sheet metal machinery and automatic can-making presses in the world.

The company is entering the aeronautical field and is preparing to manufacture in the United States the famous Bristol "Jupiter" engine, a product of the Bristol Airplane Co., Ltd., of England. The engines manufactured in the United States will be known as the Bliss "Jupiter" and will be available in both the geared and direct drive types, in models to cover practically every field. The firm is expected to start production during January, 1929, and the first American built Bliss "Jupiter" is expected to be turned out during the latter part of that month. One of the Bristol "Jupiter" engines is on display at the E. W. Bliss space at the Chicago show.

E. W. Bliss Co. is under the guidance of Frank C. B. Page, president; and Frederick D. MacKay, vice-president. General offices and the main plant are located at Ave. and 53rd St., Brooklyn, N. Y.

Boeing Airplane Co.

This concern, which manufactures both military and commercial planes in its plant at Seattle, Wash., is an outgrowth of the Pacific Aero Products Co., which was formed in 1916 and was operated under that name until the following year when a reorganization was effected and the name was changed to Boeing Airplane Co.

Since the days of the Aero Products company, remarkable progress has been made by the firm. From the combination factory and seaplane hangar occupied by the original company, the plant has been expanded until it now occupies 11 buildings, containing a total of 200,000 sq. ft. of floor space. Other units are now under construction, which will increase the total floor space 30 per cent. One of the features of the factory is that almost every item used in the construction of Boeing planes is manufactured there from the raw materials.

According to officials of the Boeing company, almost 2,000 planes of various types have been turned out by the factory to date. Up until 1927, the firm specialized almost entirely in the manufacture of military and naval planes. These included training, pursuit, attack, observation, bombing and fighting types. With the formation of Boeing Air Transport, Inc., however, the company extended its activities to the manufacture of commercial types, which include mail planes and three engined transports. The Boeing company also is producing the model B-1E flying boat. This machine is being displayed at the International Aeronautical Exposition.

The original officers of the company were W. E. Boeing, president; E. N. Gott, vice-president and treasurer, and J. C. Foley, secretary and general manager. Mr. Boeing is now chairman of the board; P. G. Johnson is president; C. L. Egtvedt, first vice-president and general manager; George P. Tidmarsh, vice-president and eastern representative; C. E. Brink, treasurer, and O. W. Tupper, secretary.

Bohn Aluminum & Brass Corp.

The Bohn Aluminum and Brass Corp. was first organized at 2512 E. Grand Boulevard, Detroit, Mich. The original officers were Chas. B. Bohn, president; P. A. Markey, vice-president and treasurer; and A. P. Lauer, secretary and assistant treasurer.

The original products were bearings, Bohnalite castings and pistons. Entering the aeronautical field, it has been supplying Ring True Bronze and Steel back babbitt lined bearings, heat treated Bohnalite castings for crankcases, pistons, cylinder heads, etc., also permanent and semi-permanent mold castings. The firm has been working with aircraft and engine builders in developing new applications of its products and improved methods of manufacture.

The present officers of the company are Chas. B.

Left to right: E. E. Norquist, Butler Aircraft Corp.; Joseph Thomas, president, Capital Aircraft Corp.; B. G. Dahlberg, president, The Celotex Co.

Left to right: Clyde V. Cessna, president, Cessna Aircraft Co.; R. B. Snowden, Jr., president, Command-Aire, Inc.; H. B. Gay, vice-pres., Electric Storage Battery Co.

Bohn, president; P. A. Markey, vice-president and treasurer; C. W. Eggenweiler, vice-president; H. W. Holt, vice-president; W. T. Bohn, vice-president; and A. P. Lauer, secretary and treasurer.

The company is showing a complete line of bearings, crankcases, air-cooled cylinder heads and other engine and control castings.

Brownback Motor Laboratories, Inc.

Brownback Motor Laboratories, Inc., 420 Lexington Ave., New York, N. Y., is exhibiting a six cylinder, 100 hp., radial air cooled engine in its display. This engine, which is known as the Model C-400, is now being manufactured by the company in Pottstown, Pa., and the first deliveries are scheduled to begin March 1, 1929.

The Brownback Laboratories originally began operations in Norristown, Pa. In 1926, the company entered the aircraft industry, becoming the importer of a foreign radial air cooled engine. Recently, however, the importation of these engines was discontinued, so that the energies of the staff might be concentrated on the development and manufacture of the model C-400.

The officials of the company are Charles H. Phelps, president; Henry L. Brownback, vice-president; and Robert G. Lyon, general manager.

Buhl Aircraft Co.

Buhl Aircraft Co., plane manufacturer, was founded in March, 1925, and established headquarters at 2730 Scotten Ave., Detroit, Mich. The original officers were L. D. Buhl, president; A. V. Verille, vice-president, and H. P. Smith, secretary and treasurer. The first model produced by the company was the Buhl "Airster," a three passenger, open cockpit biplane. This plane was particularly well received. Later the Buhl "Airsedans" were introduced. These models are of the enclosed cabin type, as the name given them implies, and include the "Senior," "Junior," "Special" and "Standard." The Buhl company has enjoyed a steady growth as a result of the popularity of its products, and now maintains its factory and headquarters at Marysville, Mich. The present officers are Mr. Buhl, president; H. Hughes, vice-president, and Mr. Smith, treasurer. The company is displaying its Senior and Sport Airsedans in Chicago this week.

Butler Aircraft Corp.

Butler Aircraft Corp. was organized last October as a subsidiary of Butler Manufacturing Co. to market the planes, hangars and aircraft accessories produced by the latter concern. The officers of the aircraft company are E. E. Norquist, president; William A. Knapp and Roy S. Kemp, vice-presidents; F. A. Rufi, secretary, and Oscar D. Nelson, treasurer. This firm is exhibiting the latest Butler plane, a cabin model, this week at the International Aeronautical Exposition in Chicago.

Recently, the company entered the airplane manufacturing business, producing the "Skyway" biplane, which was designed by Waverly Stearman. The new cabin model is the second plane developed by the company.

The headquarters of both Butler Manufacturing Co. and Butler Aircraft Corp. are located at 13th and Eastern, Kansas City, Mo. In addition, the parent organization maintains a branch in Minnesota at 900 6th Ave., Minneapolis. The officers of the manufacturing company are E. E. Norquist, president and general manager; W. A. Knapp, vice-president; R. S. Kemp, vice-president and credit manager; F. A. Rufi, secretary; and O. D. Nelson, treasurer. Victor C. Norquist is the plant engineer. C. C. Crouch is a vice-president and is also the manager of the Minneapolis division.

Canvas-Leather Specialty Co.

This company, which was established in 1903, began operations with the manufacture of golf, mail, tool, and letter carrier bags, as well as publishers' freight bags and brief cases. About five years ago, the company entered the aircraft industry with its line of "Snappy-Snug" flying clothes. The line now includes summer and winter helmets, winter flying suits of various types, face masks, and radio and crash helmets. The company also manufactures wind cones and gunners' and pilots' safety belts. Several of the models included in the Snappy-Snug line were designed for the Army and Navy. Among these are the "Navy Superior" flying suit and the "Army Special." These suits together with the "Commercial Ace" and the "DeLuxe" summer suit, which are also made by the company, are being featured in its exhibit at the

Coliseum during the aircraft show. The concern is also displaying the various types of helmets and accessories which it manufactures.

Stanley Switlik is the president; Walter Switlik is secretary; and W. A. Schlegel is the sales manager of the Canvas-Leather Specialty Co. The firm originally maintained quarters at 755-757 Cass Street, Trenton, N. J. The present address of the company is South Broad and Dye Sts., Trenton.

Capital Aircraft Corp.

After some years of experimental work and research on training planes the Air Trainer monoplane was designed and built. Four months after the actual work of construction began the plane was test flown and surpassed the expectations of the designers and builders. After the test flights of the plane had been concluded a factory site was purchased in Lansing, Mich. A short time after operations were started, to be exact on Sept. 1, 1928, a corporation was organized which elected as its president Joseph Thomas; Donald D. Thomas as vice-president; Harry Hittle, secretary, and F. D. Raynor as treasurer.

An Air Trainer model monoplane is being exhibited by the Capital Aircraft Corp. at the Chicago show.

Cessna Aircraft Co.

Cessna Aircraft Co. was organized on September 8, 1927, by Clyde V. Cessna, formerly of the Travel Air Manufacturing Company.

With Mr. Cessna as president, the following were the original officers: Geo. H. Siedhoff, vice-president; M. T. Hargiss, secretary and treasurer; C. A. McGorkle, Attorney; and W. B. Harrison, Henry J. Allen and James P. Verts, directors.

The firm is building cantilever monoplanes ranging from the two place cabin plane to the six place cabin plane. Although the company is one of the younger organizations, it reports building 50 planes the first year. The exhibit at the Chicago Show will be its latest six place cabin monoplane.

The original members of the firm still maintain their offices. Plant and administration buildings are located at 1st and Glenn Streets, Wichita, Kansas.

The Celotex Company

The Celotex Company, located at 645 North Michigan Ave., Chicago, Ill., is exhibiting at the Chicago Show a miniature hangar lined with Celotex, and also the cabin of a two-seater, Celotex lined. Celotex is a board that is manufactured from sugar cane fibre, a waste product, and is resistant to heat, cold, noise and moisture. The company is also exhibiting samples illustrating the use of Celotex in conjunction with plywood and plymetl. Celotex products saturated with pyroxylin lacquers and synthetic resins will also be shown.

B. G. Dahlberg is the president of this firm which was organized about seven years ago.

Cleveland Pneumatic Aerol Co.

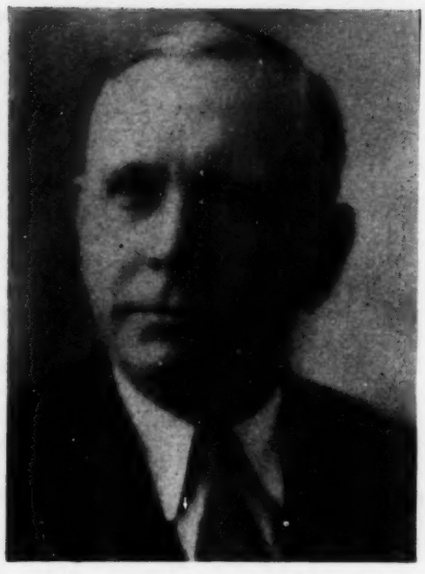
The Cleveland Pneumatic Aerol Co., 3734 E. 78th St., Cleveland, O., is the manufacturer of the "Aerol" strut landing gear. Since the introduction of these struts in 1926, a number of the leading aircraft manufacturers have adopted them as equipment for their planes, with the result that there has been a steady increase in the volume of business transacted by the Cleveland company. Eight different sizes of Aerol struts are manufactured for commercial airplanes and four are made for military and naval planes. The various sizes of struts and Aerol tail skids, which are also manufactured by the company, are being exhibited in the booth of the concern. The officers are Claus Greve, president; L. W. Greve, treasurer; and H. C. Covey, secretary.

Command-Aire, Inc.

Command-Aire, Inc., is said to be the only aircraft manufacturing concern in the South. Originally organized in the Spring of 1926 by W. F. Moody and J. Carroll Cone, with the idea of establishing a flying service at Little Rock, Arkansas, the company soon interested capital for aircraft manufacture. The firm now builds a three place open biplane designed by Albert Voellmecke.

Command-Aire, Inc., also has the American selling rights of "Phylax," an automatic fire extinguisher for airplanes. The firm has on display at the Chicago

Left to right: Joseph Leopold, president, Consolidated Instrument Co.; C. M. Keys, president Curtiss Aeroplane & Motor Co., Inc.; Maj. R. H. Fleet, president, Consolidated Aircraft Corp.



Left to right: R. B. Baker, Endicott Forging and Mfg. Co., Inc.; W. F. Wise, Ex-Cell-O Tool & Mfg. Co.; Ernest Robinson, Firchild Aerial Camera Corp.

Aircraft Show a Command-Aire biplane and the "Phylax" fire extinguishers. The exhibits are in charge of Capt. Wright Vermilya, chief test pilot.

The company was reorganized October 1, 1928. The new officers are R. B. Snowden, Jr., president; Charles M. Taylor, vice-president; and W. F. Moody, secretary and treasurer. J. J. Feeley is production manager and Mr. Voellmecke remains as chief engineer.

Consolidated Instrument Company of America, Inc.

The Consolidated Instrument Company of America, Inc. was organized in 1920 with headquarters at 461 Eighth Ave., New York, N. Y. The original officers were Joseph Leopold, president; F. K. Gundlach, vice-president, and Hugh W. Gallaher, secretary-treasurer. These men are still at the helm. The first products manufactured by this company were tachometers. Gradually the number of instruments manufactured was increased until now the company offers a complete line of aviation and marine instruments as well as a number of accessories. This line is being exhibited during the International Aeronautical Exposition.

The aviation instruments and accessories produced by the Consolidated company are altimeters, air speed indicators, engine controls, ameters, fuel strainers, "Star Path Finder" compasses, lateral inclinometers, oil pressure gauges, temperature gauges, tachometers, gasoline gauges, running lights, running light switches, landing lights, landing light switches and clocks. The company also manufactures what is known as its type "A" aircraft panel, which includes tachometer, a precision altimeter, a distance type thermometer with 10 ft. of capillary tubing and two electric lights with flexible cord connections. Consolidated aircraft instruments and accessories are now in use on a large number of planes in the United States.

The Consolidated company recently established a complete testing laboratory in connection with its New York headquarters, which are now located at 30 E. 47th St., under the directorship of E. A. Ileman, well-known engineer. Additional plans for the further development of the activities of the Consolidated company are now being formulated.

Consolidated Aircraft Corp.

Consolidated Aircraft Corp. was organized May 29, 1923, with Maj. R. H. Fleet as president and general manager; V. C. Clark, vice-president and chief engineer; G. Newman, factory manager, and Thomas Kenny, sectary-treasurer. A factory was opened in East Greenwich, R. I., and the manufacture of a plane, known as the "TW-3," was started.

Since that time the company has produced a number of other models. A number of planes of these types are now in use by the Army and Navy. The various models are the "PT-1," "NY-1" and "NY-2," both land and seaplanes; "PT-3," "O-17," "PT-3A," and the model 10 cabin monoplane. In addition, the company developed the "XPY-1" as a long distance patrol boat for the Navy. Records of the company show that since 1925 it has produced eight of the PT-3A type, 135 NY-2's, 66 NY-1's, 33 "Couriers," 138 PT-3's, 224 PT-1's, one model 10, one XPY-1 and 20 TW-3's.

The Consolidated company is now located at 2050 Elmwood Ave., Buffalo, N. Y. The present officers are R. H. Fleet, president and general manager; G. Newman, vice-president and factory manager; L. D. Bell, sales manager; J. M. Gwinn, Jr., chief engineer, Unit 1; I. M. Laddon, chief engineer, Unit 2, and Thomas Kenny, secretary-treasurer. In its exhibit, this airplane manufacturing company is exhibiting the Consolidated PT-3A, the Courier, and the "Husky Junior."

Crouse-Hinds Co.

Crouse-Hinds Co., Syracuse, N. Y., was one of the first firms to enter the aeronautical industry with a complete line of airport and airway lighting equipment. Its products include airport projectors, revolving beacons, boundary lights, landing field lights, etc.

On display in the booth of the company at the International Aeronautical Exposition are a revolving beacon; two landing field floodlights, one of which is of the 180 deg. type; a floodlight for hangar roofs, a ceiling projector, course lights, floodlights for general lighting purposes, a ceiling height indicator, boundary and obstacle lights, panelboards, hand lamps, reflectors and groundelets.

The officers of Crouse-Hinds Co. are H. B. Crouse, president; W. L. Hinds, vice-president; A. F. Hills, secretary, and W. C. Blanding, treasurer.

Curtiss Aeroplane & Motor Co., Inc.

One of the most active pioneer companies in American aviation history is the Curtiss Aeroplane & Motor Co., Inc., at Garden City, L. I., New York. The original company was organized in 1910 and located at Hammondsport, N. Y. Although the company was organized in 1910, its president, Glenn H. Curtiss, had built several planes prior to this time. His first notable achievement was the winning of the first Gordon Bennett Cup Race at Rheims, France, in 1909. In 1911 and 1912, Mr. Curtiss and his associates invented the hydro-airplane and flying boat. The Curtiss organization designed and built the Navy Curtiss NC-4, the first airplane to cross the Atlantic. It also constructed the planes that won the Pulitzer Trophy Speed Races of 1921, 1922, 1923, and 1924, and the Schneider Cup Seaplane Races of 1923 and 1925. The company designed and constructed many planes and engines for the Government in 1917-18.

Working with the Curtiss Aeroplane & Motor Co., Inc., is its sales agent, the Curtiss Flying Service, which is headed by "Casey" Jones as president. Curtiss Flying Service was also originally organized in 1910 as the Curtiss Exhibition Co. and has within the last few weeks reorganized so that its activities may be expanded to cover a nation-wide chain of flying fields, flying schools and sales and service stations.

The large display space of the Curtiss Aeroplane and Motor Co. at the Chicago Show is filled with a large number of interesting exhibits. Among them are the Curtiss "Fledgling," a training plane powered with the new 170 h.p. Curtiss Challenger air-cooled engine; the Curtiss "Robin," a three-place cabin monoplane, also powered with a Challenger. There is also at the booth a Sikorsky Amphibion with its two 410 hp. "Wasp" engines. The 170 hp. "Challenger" and the 600 hp. "Chieftain" are on display. An unique contrast is afforded by the display of the motorcycle and its 40 hp. 8-cyl. engine which was constructed by Glenn Curtiss in 1907. Curtiss-Reed metal propellers are also in the booth. The exhibit is in charge of C. S. Jones, and M. V. Clements.

C. M. Keys is president of the Curtiss Aeroplane & Motor Co. Other officers are F. H. Russell, vice-president; J. A. B. Smith, secretary-treasurer; Leonard Kennedy, vice-president; W. L. Leaycraft, assistant treasurer, and A. C. Williams, assistant secretary and cashier.

Armco Culvert Manufacturers' Association

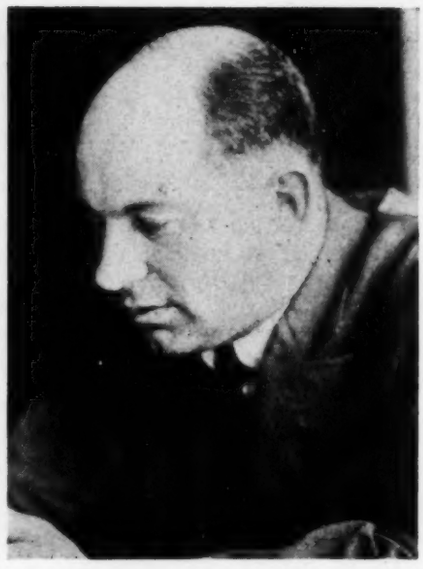
Armco Culvert Manufacturers' Association is an organization of 31 culvert manufacturers in the United States and Canada, who produce corrugated metal culverts constructed of "Armco" ingot iron. The association was formed in 1906, and in the first years of existence devoted its attention largely to the manufacturing and legal problems that confronted its members. Today, the organization is engaged in research and educational work, as it has been since 1923. The headquarters of the association are located in Middletown, O.

The members of the Culvert Manufacturers' Association are Bark River Bridge & Culvert Co., Boardman Company, Burnham Mfg. Co., California Corrugated Culvert Co., Canada Ingot Iron Co., Ltd., Dixie Culvert & Metal Co., Dixie Culvert Mfg. Co., Hardesty Mfg. Co., Highway Products & Mfg. Co., Independence Corrugated Products Co., Ingot Iron Railway Products Co., Iowa Pure Iron Co., Kentucky Culvert Mfg. Co., Louisiana Corrugated Culvert Co., Lyle Culvert & Road Equipment Co., Maryland Culvert & Metal Co., Missouri Pure Iron Co., Nebraska Culvert & Mfg. Co., New England Metal Culvert Co., North East Metal Culvert Co. (Division of New England Metal Culvert Co.), Northwestern Sheet & Iron Works, Ohio Corrugated Culvert Co., The W. Q. O'Neall Co., Pure Iron Culvert & Mfg. Co., Road Supply & Metal Co., Sioux Falls Metal Culvert Co., Spokane Culvert & Tank Co., Tennessee Metal Culvert Co., U. S. Bridge & Culvert Co., Virginia Culvert Corp. and Western Metal Mfg. Co.

Curtiss-Robertson Airplane Mfg. Co.

Curtiss-Robertson Airplane Mfg. Co. is a combination of the engineering experience of Curtiss Aeroplane & Motor Co. and the manufacturing and merchandising experience of a group of St. Louis business men. The Curtiss-Robertson company was founded last February. On March 5, ground was broken on the St. Louis Flying

Left to right:—Gerard Swope, president, General Electric Co.; P. W. Litchfield, president, Goodyear Tire & Rubber Co.; Jule M. Hannaford Jr., Gordon & Ferguson



Left to right:—C. H. Day, vice-president Gates-Day Aircraft Corp.; A. Francis Arcier, vice-president, General Air planes Corp.; Anthony Fokker, Fokker Aircraft Corp. of America.

Field for the factory of the new concern. The buildings were erected, on May 21, equipment and tools were moved in, and, on August 7, the first plane left the end of the production line. Since that time, the Curtiss "Robin," the three passenger cabin monoplane produced by the company, has been in quantity production.

William B. Robertson, an old-time pilot, who has had many years of experience in the operation of air lines, aerial service, and in the buying and selling of aeronautical materials, is the president and general manager of the Curtiss-Robertson company. C. M. Keys, president of the Curtiss Aeroplane & Motor Co., is vice-president, and J. D. Livingston, of St. Louis, is secretary and treasurer. On the board of directors are J. A. B. Smith, treasurer of Curtiss Aeroplane & Motor Co.; Harry Hall Knight, of Knight, Dysart and Gamble; Arnold G. Stifel, of Stifel, Nicolaus and Co.; F. H. Russell, vice-president of Curtiss Aeroplane & Motor Co.; James C. Willson, president of Jas. C. Willson and Co., and Harold M. Bixby, of the State National Bank of St. Louis. The officers of the company are likewise directors.

The Curtiss-Robertson monoplane, which was designed for use with either a Curtiss OX5, or the new Curtiss "Challenger" engine, may be seen at the exhibit of the Curtiss-Robertson company in Chicago this week.

DeWalt Products Corp.

DeWalt Products Corp., manufacturer of wood and metal working machinery with headquarters and factory at Leola, Lancaster County, Pa., is an outgrowth of DeWalt Products Co., which was organized as a partnership Dec. 15, 1924, by I. L. Rutt and Paul Gardner. The partnership continued until last October, when the organization was incorporated as DeWalt Products Corp. The present officers are Mr. Gardner, president; Mr. Rutt, vice-president and teasurer; W. Ross Stevens, secretary, and Wilbur L. Gardner, assistant treasurer.

The original DeWalt Products Co. first entered the aeronautical industry with the introduction of the DeWalt "Wonder Worker." This is a wood-cutting machine, designed to cut at any angle, or any combination of angles. Later, when airplane manufacturers began to adopt metal construction the company developed the DeWalt "Wonder Metal Worker," which operates along the same lines as the Wonder Worker, but which cuts metal instead of wood. Both of these machines are on display at the Chicago show.

In addition to the Wonder Worker and the Wonder Metal Worker, the DeWalt Products Co., manufactures a cut-off and miter saw; marble cutter; individual driven band saw; direct motor driven mortiser, and a direct driven jointer.

Driggs Aircraft Corp.

The Driggs Aircraft Corp., of Lansing, Mich., was organized in February, 1927, with H. F. Harper, president; Ivan H. Driggs, vice-president; E. C. Fields, secretary, and H. B. Lundberg, treasurer. These men are still in command. The company at once began the manufac- of the Driggs "Dart" light airplane. Although the firm is of late origin, Mr. Driggs, the chief designer, and his planes, have been well known in the industry for a number of years. Mr. Driggs has made a close study of light airplane building in Europe and is one of the best informed engineers so far as light aircraft are concerned in the United States today. The "Skylark," a new plane produced by the Driggs Aircraft Corp., is being shown for the first time at the exhibit of this airplane manufacturer.

The Electric Storage Battery Co.

The Electric Storage Battery Co., manufacturer of "Exide" batteries, was organized June 5, 1888. The original address of the company was Gloucester, N. J. In September, 1917, the company began the manufacturer of its first airplane storage batteries.

From the original ignition batteries, the company made rapid progress in the development of larger aircraft batteries for starting purposes, as well as to meet the present needs of aircraft lighting equipment. The latest development of the company is that of special batteries to be used for radio beacon receiving sets when a separate battery is required in the plane. A standard line of aircraft batteries is being exhibited at the show.

The officers of the company are John R. Williams, president; Kenneth B. Schley, vice-president; Bruce Ford,

vice-president and general manager; H. B. Gay, vice-president, and Walter G. Henderson, secretary and treasurer. The present address of the Electric Storage Battery Co. is Allegheny Ave. and 19 St., Philadelphia, Pa.

Elgin National Watch Co.

Elgin National Watch Co. was organized August 27, 1864. The original officers, when the company first began operations at Elgin, Ill., were B. W. Raymond, president; B. F. Lawrence, vice-president, and G. M. Wheeler, secretary-treasurer.

The company entered the aeronautical field in 1917 when it began the manufacturer of the Army type "C" Elgin chronometric tachometer. Since that time its aircraft business has been expanded to include the manufacture of Elgin unit control boards, "Avigo" compasses, and ball bank indicators. These products may be seen at the booth of the company.

The present officers are DeForest Hulburd, president; Taylor Strawn, vice-president; J. R. Perry, secretary-treasurer; W. S. Campbell, assistant secretary-treasurer. and Gordon C. Gillies, manager of the aircraft instrument division, which is located at Elgin, Ill.

Endicott Forging & Mfg. Co., Inc.

The Endicott Forging & Mfg. Co., Inc., was founded at Endicott, N. Y., in 1915, by S. J. Marshall, president and treasurer; Walter A. Lester, vice-president, and Thos. A. MacClary, secretary. This firm entered the aeronautical field in 1918, specializing in aero engine and plane forgings. The company, during the last 10 yr., his furnished forgings to many of the foremost aircraft engine builders. The officials state that much emphasis is put on the proper control of heating, chemical forging and a special selection of steel, regardless of its chemical classification. This careful method of manufacture is creating each year a much heavier demand for Endicott forgings.

Hammer equipment, capable of handling forgings ⅛ to 80 lb., is on display at the Chicago Show.

The management of the concern is directed by S. J. Marshall, president and treasurer; T. B. Kelday, vice-president, and D. O. Freeman, secretary. The factory is still located at its original address.

Ex-Cell-O Tool & Manufacturing Co.

Ex-Cello-O Tool & Manufacturing Co. was organized in Detroit, Michigan, in 1919, by N. A. Woodworth as president. The firm entered the aeronautical field in 1921 with engine parts involving precision internal grinding. Since that date the company has greatly enlarged its line of parts. It is now devoting a department of the business to aircraft engine parts and is serving practically all the leading engine builders.

The company has on display, at the Chicago Show, samples of its full line of engine parts.

N. A. Woodworth is president and P. Huber is secretary. Wm. F. Wise, production engineer, is in charge of the aircraft engine parts, also in charge of all sales to the industry. The company is now located in its new building at 1200 Oakman Boulevard, Detroit, Michigan.

Fairchild Aviation Corp.

The Fairchild Aviation Corp. built its first airplane to carry on with the aerial photography which the Fairchild aerial camera had made possible. However, it was soon found that the planes could be marketed for many other purposes and the company, therefore, entered the manufacturing business with a line of planes as well as its line of aerial cameras which had been developed by Sherman M. Fairchild, who is president of the firm.

The first Fairchild folding wing cabin monoplanes were built in 1926. The firm is building three models to be produced during 1929—a two place low-wing commercial training plane (the "21"); a four place cabin plane powered with a Wright "Whirlwind" (the "41"); and a seven place cabin plane powered with a Pratt and Whitney "Wasp" (the "71"). All three of these planes are being shown at the Chicago show. The Fairchild Aviation Corp. exhibit there also includes a miniature model of the factory and airport at Farmingdale, L. I.

Fairchild airplanes have been used in the tropics and in Northern Canada as well as in the United States. Mears and Collyer used a Fairchild on their record breaking 23 day trip around the world. Duke Schiller, the first to reach the Bremen flyers at Greenely Island, flew a Fairchild heated cabin plane.

The principal subsidiaries of the Fairchild Aviation

Left to right:—Francis Rogers, Guaranteed Aircraft Hangar Co.; James R. Fitzpatrick, vice-president, Haskelite Mfg. Co.; Charles W. Hall, president, Hall Aluminum Aircraft Corp.

Left to right:—Edward Hughes, general manager, Heywood Starter Corp.; Harry M. Runkle, International Derrick & Equipment Co.; George Waite, president, Irving Air Chute Co.

Corp. are: the Fairchild Airplane Manufacturing Corp., Farmingdale, L. I.; the Fairchild Aerial Camera Corp., and the Fairchild Aerial Surveys, Inc., both of which have offices at 270 W. 38th St., New York, N. Y. Graham B. Grosvenor is president of the Fairchild Airplane Manufacturing Corp.

Fairchild Aerial Camera Corp.

This company began operations, when it was organized in 1918, with the manufacturer of military aerial cameras. These cameras met with immediate approval. As a result, the Fairchild Aerial Camera Corp. is now one of the largest manufacturers of aerial cameras in the world. The cameras manufactured by the company are now used as standard equipment by the U. S. Army and Navy, the Royal Canadian Air Force and by the air corps of other governments. Fairchild cameras hold the military altitude record for photography, and also were selected by Comdr. Richard E. Byrd, U.S.N. (Ret.), and Sir George H. Wilkins, for use during their explorations. Fairchild cameras were likewise selected by Dr. Hamilton Rice.

The Fairchild Camera Corporation is a subsidiary of the Fairchild Aviation Corp., which was organized to finance, hold the stock of and manage subsidiary corporations in both the manufacturing and operating fields of aviation. The present heads of the camera company are Sherman M. Fairchild, and Ernest Robinson. Headquarters for the company are maintained at 270 W. 38 St., New York, N. Y. The complete line of aerial cameras manufactured by this concern are being shown in Chicago.

Fokker Aircraft Corp. of America

In 1911, Anthony H. G. Fokker built and flew the first Fokker airplane, the "Spider," and new models designed by him followed in rapid succession. Up to the present time, it is said that no less than 53 different types have been produced carrying the Fokker trade-mark and over 10,000 Fokker aircraft have been manufactured.

The Atlantic Aircraft Corp., Fokker's first American venture in construction of planes, was organized on December 13, 1923. In November, 1927, Fokker Aircraft Corp. of America was formed and the Atlantic Aircraft Corp. absorbed. The Fokker Corporation now operates three factories, the Teterboro factory, the Glendale, Calif. factory, and one at Passaic, N. J. Under the personal direction of A. H. G. Fokker, the firm started its first American operations by furnishing the U. S. Army Air Corps with welded steel tube fuselages. In 1925, it developed and placed in production an entirely American type of commercial cabin monoplane known as the "Universal." This popular airplane has continued in production with minor refinements. The Fokker F-7 three-engined plane, was also introduced in 1925. This model was later modified for use by the U. S. Army and Marine Corps as military transport and ambulance planes.

Many spactacular long-distance flights, the most outstanding of which was the flight of Kingsford-Smith and Ulm from United States to Australia and Commander Byrd's flight over the North Pole, were made by the Fokker F-7 plane.

The newest planes developed by the Fokker organization is the F-10, a 14-passenger high-speed commercial monoplane powered with three Pratt & Whitney "Wasp" engines, and an 8-pass. metal hulled amphibian with a Pratt & Whitney "Wasp" or "Hornet" engine.

The firm has on display at the Chicago show an F-10A, the 14-passenger "Wasp" engined plane, a DeLuxe Super Universal, one of their newest creations, and the metal-hulled amphibian.

The directors of the corporation are Anthony H. G. Fokker, Jas. A. Talbot, Harriss M. Hanshue, H. B. Tibbetts, John A. Love, Louis H. Piker, G. F. Lewis, J. B. Parker, W. P. Wilson, T. T. E. Gregory and H. A. Reed. General offices are at Hasbrouck Heights, N. J.

Follmer, Clogg & Co.

Follmer, Clogg & Co. was organized in 1884 by C. J. Follmer, L. H. Clogg, William Christian, Theodore Butts, Jr. and James L. Brown. In the Fall of 1917 the company entered the aircraft industry with the introduction of its first parachutes.

To date the company has manufactured parachutes, parachute silks, flare parachutes and aerial tow-targets. The products of the company are well known and are used by the U. S. Army and Navy. The "Positive Opener" parachutes and parachute silks developed and produced by the concern are being featured in its display.

The present officers of the company are H. W. Hartman, president; W. E. Morrison, vice-president, and J. I. Hartman, secretary and treasurer. The address of the company is 258 W. King St., Lancaster, Pa.

Gates-Day Aircraft Corp.

The Gates-Day Aircraft Corp. was organized Dec. 1 1927. It is an outgrowth of the Gates Flying Circus which was organized in 1911 and was in active operation until the formation of the new company. The aircraft company is headed by Ivan R. Gates, president; Charles Healy Day, vice-president and chief engineer; George Daws, secretary, and R. H. Reiffin, treasurer. Headquarters are maintained at 909 E. 23 St., Paterson, N. J.

The company is now producing a five passenger sesquiplane which is known as the Gates-Day "New Standard" or "GD-24." This plane is being exhibited by the company in Chicago. The plane was designed by Mr. Day, who produced the famous J-1 Standard. Mr. Day is well-known for his activities in the aeronautical industry, with which he has been connected since 1909. He was formerly associated with Glenn Martin. Mr. Gates is one of the oldest commercial operators from the standpoint of experience.

General Electric Co.

The General Electric Co. is a direct outgrowth of the activities of two earlier electrical manufacturing concerns, the Edison General Electric Co. and the Thomson-Houston Electric Co. In 1892 these two enterprises were consolidated and the new company was given the name, General Electric. It was incorporated on April 15 of that year and began doing business in its own name on June 1.

The General Electric Co. entered the aeronautical manufacturing industry in 1917, manufacturing superchargers for use on aircraft in that year. In 1918, the Company entered experimental floodlight work in Army airport lighting. In 1923, it entered the field of lighting equipment for airports and airways on a commercial basis. In this year, the illumination of air mail routes by beacons was accomplished. The majority of the material for lighting these and other airways and airports was furnished by this Company.

C. T. McLaughlin, assisted by H. E. Ritchie and W. A. Thorpe, are in charge of the General Electric exhibit at the Chicago Show, where there is on display an airport beacon, ceiling light, type ALH airport floodlight, boundary lights, 180 deg. floodlight magnetic compass, magnetic compass, gasoline gauge, and superchargers.

The following are officers of the company: O. D. Young, chairman of board; Gerard Swope, president; E. W. Allen, vice-president; D. R. Eullen, assistant vice-president; Wm. W. Trench, secretary; R. S. Murray, treasurer; S. L. Whitestone, comptroller. The home office is located at Schenectady, N. Y.

General Airplanes Corp.

The General Airplanes Corp., 550 Abbott Road, Buffalo, N. Y., entered the aeronautical industry in June of this year. A. J. Brandt is president and general manager; L. A. Listug, treasurer; G. A. Townsend, secretary; G. MacLean Gardner, vice-president in charge of manufacturing, and A. Francis Arcier, vice-president in charge of engineering.

Experimental work was started in April, 1928, and, upon the completion of the work of organization, the firm started production of a three passenger cabin monoplane, one of which was accepted by Comdr. Richard E. Byrd for use on his Antartic Expedition. One of these planes is on display at the Chicago exhibition.

Globe-Superior Corp.

Globe-Superior Corp., Abingdon, Ill., was formed as a result of a merger in 1921 of the Globe Shirt and Overall Co., Abington, and the Superior Garment Co., of Columbia City, Ind. The joining of the two companies made the new concern one of the largest manufacturers of work and play clothing in the country. Seven factories are now operated by the firm.

While the Globe-Superior company did not go into full production of a line of flying clothes until 1927, the original Globe Shirt and Overall Co. marketed its first designs of flying togs in 1910. This company was organized in 1889 with S. T. Mosser, Mrs. S. T. Mosser, and J. Cox as executives. The present officers of the Globe-Superior company are B. D. Adams, president; L. L. Mosser, vice-president-treasurer, and C. H. Snyder, secretary.

The "Protexall" and the "Silver Ace" lines of flying clothes are being shown by the company during the air-

Left to right:—J. H. Shearer, treasurer, Kendall Refining Co.; Francis Plym, president, The Kawneer Co.; E. A. Johnson, president, Johnson Airplane Supply Co.

Left to right:—Edgar N. Gott, president, Keystone Aircraft Corp.; A. H. Kreider, president, Kreider-Reisner Aircraft Co.; E. M. Laird, E. M. Laird Airplane Co.

craft show. Three suits of the "Protexall" line are being featured particularly. They are the Protexall "Aviator's Suit," "Pilot's Suit" and "Ground Suit." The Silver Ace pilot's suit likewise is featured in the exhibit of the company.

B. F. Goodrich Rubber Co.

Dr. B. F. Goodrich launched the B. F. Goodrich Rubber Co. at Akron, Ohio, in 1869. The first product was fire hose, and soon after, garden hose. Dr. Goodrich believed so strongly in the unlimited field of rubber that the company is now said to be manufacturing about 30,000 different products of rubber and rubber combinations.

The firm made its first airplane tire in 1912 when most planes were landing on skids. During the War, Goodrich manufactured a full line of airplane accessories and supplied the overseas forces and the Allies with observation balloons and lighter-than-air fighting material.

Today the firm manufacturers a line of airplane tires, tail wheel tires, airplane tubes, streamline pontoon hand hole covers, shock absorber disks and tubing, airplane matting, special molded rubber goods, such as grommets, handle grips, etc., also miscellaneous types of hose used on aircraft. Goodrich maintains a service plane with Cy Caldwell as pilot, having dealers at all the principal airports.

A selected line of the above products is shown in its booth at the Chicago Aircraft Show.

The present officers are J. D. Tes, president; S. M. Jett, secretary, and V. I. Montenyohl, treasurer. Administration offices and main plant are both located in Akron, Ohio.

Goodyear Tire & Rubber Co.

The Goodyear Tire & Rubber Co. is one of the pioneer American manufacturers of tires and rubber products. In 1910 Goodyear entered the aeronautical field by manufacturing kite and free balloons. In 1924 the Goodyear Zeppelin Corp. was organized with P. W. Litchfield as president and Dr. Karl Arnstien, vice-president and chief engineer. Goodyear officials have reported their firm has built, in addition to airplane tires and accessories, 1,000 balloons, 105 non-rigid airships and 1 semi-rigid airship.

The Goodyear Zeppelin Corp. was awarded, in October, 1928, Naval contracts for two 6,500,000 cu. ft. rigid airships. Hangars are now in course of construction at Akron to enable the fulfillment of this contract.

The firm has on display at the Chicago Show, parts for lighter-than-air craft, airplane tires and airship models.

The present officers of the Goodyear Zeppelin Corp. are P. W. Litchfield, president; Dr. Karl Arnstien, vice-president and chief engineer; and Comdr. J. C. Hunsacker, U.S.N. retired, vice-president in charge of commercial affairs.

Gordon & Ferguson, Inc.

Gordon & Ferguson, Inc., manufacturer of clothing, was organized in 1871 in St. Paul, Minn., where its offices are still maintained. Richards Gordon was the first president and treasurer, and was assisted by Paul D. Ferguson, who was the vice-president and secretary.

This company entered the aeronautical industry in 1917 when it began the manufacture of fur lined flying suits for use by the U. S. Government. The firm has added to its line of clothing, until now, it is offering outside clothing for government and commercial pilots for use "from head to toe." Gordon "Aerotog" clothing is on display in Chicago during the International Aeronautical Exposition.

The present officers are C. W. Gordon president; J. N. Jackson, vice-president; W. W. Skinner, treasurer, and J. M. Hannaford, Jr., secretary.

Great Lakes Aircraft Corp.

Great Lakes Aircraft Corp. is one of the newcomers in the field of airplane manufacture, yet it begins with an auspicious background. The corporation was organized by a strong banking group, which recently acquired the entire Cleveland physical properties of the Glenn L. Martin Co., pioneer plane manufacturer, and will operate them through the new organization.

The Martin plant, which, under the terms of the agreement reached, has become the property of Great Lakes Aircraft Corp., is situated on a 70 acre tract of land at 16800 St. Clair St., Cleveland, O. With the original buildings, constructed in 1918, and the additions made in 1927, the factory now contains a total of 80,000 sq. ft. of floor space. Unlimited opportunity for further expan-

sion is also provided. Aside from the plant, which is one of the best equipped and most efficient in the industry, the Great Lakes company obtained a lease on the adjoining flying field, to be used for testing new planes.

The right to manufacture all existing types of Martin planes for both military and commercial purposes was granted the Great Lakes corporation at the time of the sale. This agreement includes the right to produce the Martin "74," or the "T4M-1," as it is known to the Navy, which is now using planes of this type for torpedo and bombing work. A T4M-1 without the fabric covering is on display at the Armory this week. Planes of this type will later be developed for use in commercial aviation for mail, express and passenger carrying. In these planes the open cockpit construction will be substituted by an enclosed cabin.

Glenn L. Martin is connected with the new company only in an advisory capacity. William Robert Wilson, who is well known in automobile and banking circles, is chairman of the board of directors of Great Lakes Aircraft Corp., and C. F. Van Sicklen is vice-president in charge of sales.

Guaranteed Aircraft Hangar Co.

Guaranteed Aircraft Hangar Co. was formed in April, 1920, as a manufacturer of commercial, industrial and private buildings. The original address of the company was Jamaica, L. I., and the original officers were Francis Rogers and George Hitz.

In February, 1926, the company began the manufacture of airplane hangars. Since that time, the business of the firm in hangars has grown to such proportions that it was found necessary to purchase a plane so that one of the executives might keep in constant touch with the trade and at the same time oversee the erection of Guaranteed hangars in various parts of the country. The foreign business of the Guaranteed company has also increased to a great extent and the company has contracted with the Ad. Auriema, Inc., an export company, for the handling of all but domestic business.

A model of one of the Guaranteed steel hangars is on display at the exhibit of the company in Chicago. The present officers are Francis Rogers, George Hitz and K. Granello. The offices of the company are situated at 135-04 Jerome Ave., Richmond Hill, N. Y.

Greer College

Greer College, founded in 1902 by Erwin Greer for training automotive mechanics, entered the field of aviation in 1927. In July, 1928, this school absorbed the Chicago Aviation and the Viking Aircraft Co. It started an aircraft school, which includes both flying training and a complete ground course in airplane and engine mechanics. Capt. C. G. Bryan is in charge of the ground and shop training department and Wally W. Meyer is chief pilot for the concern. Lieut. Wally Meyer was, for a number of years, a U. S. Army Air Service instructor and later trained hundreds of civilians.

The company is exhibiting at the Aircraft Show, displays of students' handiwork and show views of the equipment and shops.

The officers of the school are Erwin Greer, president; J. C. Bryan, R. J. Bassett, R. N. Hoffman, H. Cutright, H. McCormick, and W. W. Meyer. The school is located at 2024-26 Wabash Avenue, Chicago, Ill.

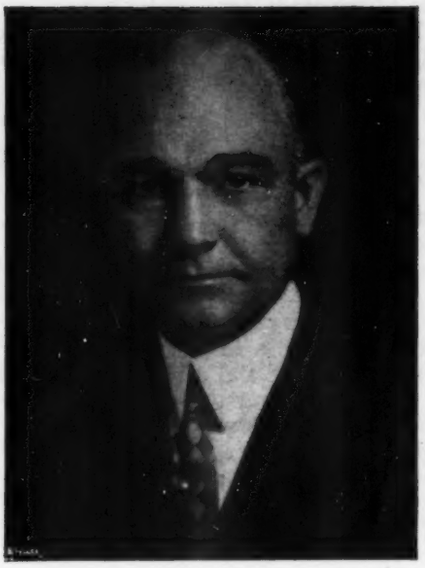
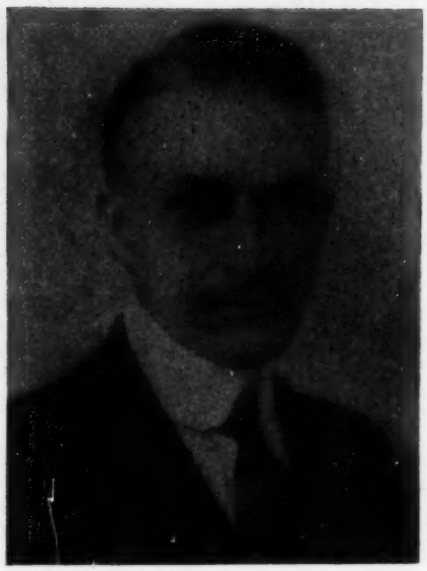
Hall-Aluminum Aircraft Corp.

Hall-Aluminum Aircraft Corp. has, since its inception, interested itself in the use of aluminum alloy in aircraft construction. This development work was initiated originally in 1916 by Charles Ward Hall, president of the aluminum company. In 1919, he associated himself with Charles F. Pape and T. Mahoney. The result was the formation of what was known as Charles Ward Hall, Inc., and afforded a nucleus for the present corporation, which was organized last year.

The U. S. Navy Department in 1920 became interested in the work, which was being carried on by Charles Ward Hall, Inc., at the factory in Mamaroneck, N. Y. Contracts were awarded the corporation at that time for the construction of two sets of metal wing panels for the HS-3 flying boat. Later the Navy awarded the company contracts for other aluminum alloy aircraft and parts, which included the TS-1 in metal, wings for the TN-1 and amphibian floats for the T3M-2.

With the formation of Hall-Aluminum Aircraft Corp. the company moved into a larger factory at 2050 Elmwood Ave., Buffalo, N. Y. Since that time it has been working on two new all-metal planes for the Navy; one a patrol type of flying boat and the other a single seater

Left to right, Jessel S. White, vice president, Macwhyte Co.; H. B. Lundberg, president, Michigan Screw Co.; John C. Nulsen, vice president, Mahoney-Ryan Aircraft Corp.

Left to right: Stanley Partridge, Mohawk Aircraft Corp.; George H. Townsend, president, Moto-Meter Co., Inc.; Earle H. Reynolds, president, National Air Transport, Inc.

shipboard fighter which it is expected will be test flown early next year.

In the exhibit of the company may be seen a number of aluminum alloy parts and an airplane without covering, showing the application of these parts. The parts include integral blanked and pressed ribs, and built up ribs. In addition standardized float and hull sections are shown.

Aside from Charles Ward Hall, the officers of the company are Archibald M. Hall, vice-president, and Mr. Pape, who is secretary and treasurer. S. K. Colby of the Aluminum Company of America, and Clinton R. Wyckoff, of the Atlas Steel Castings Co., and the officers are the directors.

Hamilton Metalplane Co.

Hamilton Metalplane Co., manufacturer of all-metal airplanes, as the name implies, was organized July 12, 1927. Since that time the firm has produced several different models of the same general type. The latest is a cabin monoplane capable of carrying six passengers in addition to the pilot and a navigator. Planes of this type are constructed entirely of "Alclad," which is a non-corrosive metal manufactured by using a core of a strong aluminum alloy with a thin layer of pure aluminum on either side. The new Hamilton "Metalplane," which is powered with a Pratt & Whitney "Hornet," is on display at the exhibit of the company in Chicago. The present address of Hamilton Metalplane Co. is 530 Park St., Milwaukee, Wis. The officers of the company are Thomas F. Hamilton, president; Charles F. Barndt, vice-president and general manager; Clarence R. Falk, vice-president; Randolph Hokanson, treasurer, and William F. Pabst, secretary.

Stewart Hartshorn Co.

Stewart Hartshorn Co., wire manufacturer, was founded at East Newark, N. J., in 1860. The company entered the aero field in 1918 when it began to furnish large quantities of Hartshorn wire to manufacturers of aircraft. During the last ten years it developed and introduced to the industry many types of streamline and square section wires.

The Stewart Hartshorn exhibit at the Chicago show includes streamline and square section internal tie rods, and Army-Navy fork and fittings, in addition to the regular line of aircraft wire produced by the company.

Stewart Hartshorn, president; H. W. Black, vice-president; S. A. Hartshorn, vice-president; E. L. Durgin, treasurer; B. E. Bushnell, director of sales, and J. M. Layng, aeronautical representative, direct the activities of the company, which is now located at 250 Fifth Avenue, New York, N. Y.

Haskelite Manufacturing Corp.

Haskelite Manufacturing Corp., maker of plywoods with headquarters at 120 S. La Salle St., Chicago, Ill., entered the aeronautical field during the World War. To date, the firm has manufactured "Haskelite," "Plymetl," "Aluminum-Plymetl" and "Duralumin-Plymetl," which have a wide variety of uses in airplane construction. Samples of these materials are on show in Chicago, as well as airplane parts to demonstrate the use of the materials. The parts exhibited were furnished the Haskelite company by a number of well-known airplane manufacturers. The company is also showing its "Scene-In-Action" sign, illustrating the extent to which its products are now used in the fields of transportation.

The Haskelite corporation is headed by George R. Meyercord, president; James R. Fitzpatrick, vice-president and secretary; A. O. Johnson, treasurer, and Howard B. Dunton, assistant secretary and treasurer.

Heywood Starter Corp.

Heywood Starter Corp., manufacturer of the Heywood high presssure injection starter for aircraft engines, was organized originally as Detroit Air Appliance Corp., with headquarters at 6547 St. Paul Ave., Detroit, Mich. Last May, a reorganization of the company was effected and its name was changed to Heywood Starter Corp., under which it has been operating since that time.

The officers of the original Detroit appliance company were S. L. McKay, president, and H. V. Wilkie, secretary and treasurer. Under the new plan of organization, Mr. McKay retained his position as head of the company, Mr. Wilkie became treasurer, and F. B. Stover was elected secretary. Edward Hughes is general manager. The present address of the Heywood company is the same as it was when operating as the air appliance corporation.

The Heywood starter was introduced to the trade for the first time about a year ago. It has been well received, and, to date, it is said that 200 of these starters have been sold. The Heywood product is being demonstrated this week in booth "B-13."

Horlick's Malted Milk Corp.

Horlick's Malted Milk Corp., manufacturer of Horlick's malted milk and other malted food products, was organized in 1873. The products of the company are exceedingly well known, and are used extensively. Officials of the concern boast that its malted milk, which is said to contain the vitamins and beneficial elements of rich, full-cream milk, as well as of the best barley and whole wheat, has been used by many famous explorers.

With the development of aircraft and aircraft engines to the point where long distance flights might be undertaken, the malted milk manufactured by the Horlick company found a new field. Horlick's malted milk lunch tablets, because of the combined small bulk and weight and concentrated food value, have been carried by Clarence D. Chamberlin, "Art" Goebel, Ernest L. Smith, Lieutenants Maitland and Hegenberger, Miss Ruth Elder, Miss Amelia Earhart, Lady Heath, Sir Hubert Wilkins and Commander Byrd.

The Horlick Malted Milk Corp., which maintains its dairies, laboratories and plant at Racine, Wis., is demonstrating the usefulness of its malted milk in powder form and the malted milk lunch tablets, in both the natural and chocolate flavors, at its booth in the Coliseum.

The International Derrick & Equipment Co.

The International Derrick & Equipment Co., which is now one of the largest makers of airway beacon towers in the world, was organized in 1925. At that time Gordon Battelle became president; H. M. Runkle, vice-president and general manager, and R. R. Bloss, chief engineer. In 1926, the company entered the aeronautical industry when it first introduced its beacon towers. These towers met with approval and since that time the line of aircraft products has been gradually increased, until now the company manufactures a complete line of airplane hangars, standard steel buildings, flood light towers, radio towers, mooring masts and landing light supports. The various aeronautical products made by the company at the present time are now on display in Chicago. Mr. Runkle is now president of the concern, Mr. Bloss is general manager, and C. G. Runkle is secretary. The headquarters of the company are located at 875 Michigan Avenue, Columbus, O.

Irving Air Chute Co., Inc.

Irving Air Chute Co., Inc., was organized in 1918 and established headquarters at 523 Main St., Buffalo, N. Y., where the company is still located. The original officers were George Waite, president and treasurer, and Leslie Irvin, vice-president and secretary. These men still hold their same positions with the company.

The company began with the manufacture of parachutes for use in both heavier-than-air and lighter-than-air craft, and has continued to produce the same type of equipment. The parachutes developed and perfected by this company have saved the lives of more than 135 aviators, officials of firm say, and have been used in emergencies covering practically every conceivable form of airplane accident. Parachutes manufactured by the Irving Air Chute Co. are now used as standard equipment by the aviation services of Great Britain, the United States and a number of other nations.

At the exhibit of the Irving company in the Coliseum during the aircraft show the complete line of "Irvin Air Chutes" may be seen.

Johnson Airplane & Supply Co.

The original partnership of the Johnson Airplane and Supply Co. was started in 1919 at Wilmington Pike and Patterson Road, Dayton, O., by E. A. Johnson and J. M. Johnson. The first company started as a supply company selling war surplus airplanes, engine parts and accessories. The Johnson Flying Service started operating in 1924. In 1926, the Johnson Aircraft Corp. was organized for the purpose of manufacturing the Johnson Twin-Sixty engine.

The firm is said to now carry a large supply of high quality airplane supplies, selling regularly commercial builders of aircraft, airports, dealers and jobbers in aeronautical equipment. The company maintains its own

Left to right: Howard Beazley, treasurer, Nicholas-Beazley Airplane Co.; W. M. Nones, Norma-Hoffman Bearings Corp.; N. A. Walcott, president, Packard Electric Co.

laboratories for testing and inspecting equipment also an aeronautical engineering staff for development of new products.

On display at the Chicago Aircraft Show are many products of the company's own development, including tail skid wheel, steel wheels with and without brakes, strut air-speed indicator, safety belts and speaking tubes.

The firm moved to its own building, covering one-half block at 900 So. Ludlow Street, Dayton, O., in 1926. The present officers are E. A. Johnson, president; D. E. Dunlap and J. L. Steinbruner.

Kendall Refining Co.

The Kendall Refining Co., which was organized in 1882, entered the aeronautical industry in 1925. Its lubricating oils have been well received, and in spite of the comparatively recent entry of the company into the field, it boasts that 25 of the 40 planes finishing in the recent New York to Los Angeles air derbies used Kendall "Penzbest" engine oils, a brand recommended by the concern for use in aircraft engines.

Samples of the Kendall oils are on exhibit in the booth of the company at the Coliseum. In addition to these, the company is exhibiting at the aircraft show the process board, which shows every operation in the refining of crude oil from the time it reaches the refinery until it is finished into its more than forty by-products. A study of the board is the equivalent of a trip through the refinery, inasmuch as it shows the extreme care and expensive machinery that is necessary to refine a high grade lubricating oil.

The present officers are Otto Koch, president; H. H. Greene, vice-president; I. H. Shearer, treasurer, and J. B. Fisher, assistant treasurer. The main office and refinery of the company are located at Bradford, Pa.

Joseph Kreutzer Corp.

Joseph Kreutzer Corp. has operated a number of years as an automobile sales and service organization at 1801 South Hope Street, Los Angeles, Calif.

The Aircraft Division of this company was organized in August, 1928. The firm manufacturers a tri-engined four-place cabin plane. These planes are being built for the company's own use as operator of an aviation school and an airport, for use in sight-seeing flights and also for the commercial market.

On display in the company's booth at the Chicago show is one of the tri-engined four-place planes.

The present officers of the company are Joseph Kreutzer, president; A. J. Edwards, first vice-president and manager of the Air Division; D. B. Schindler, second vice-president and Otto Konslauzer, secretary and treasurer.

The offices of the Aircraft Division are now located in Room 655, Chamber of Commerce Building, Los Angeles, California.

The Kawneer Co.

The origin of The Kawneer Co. of Niles, Mich., dates back to 1905, when Francis J. Plym, a practicing architect at that time, made the first all metal store front. Shortly after this first store front was made the firm was organized with Mr. Plym as president, a position which he still holds.

The Kawneer Co. entered the aeronautical field about the time of United States' entry in the World War. At that time this company manufactured all steel rudders, elevators, trailing and leading edges, ailerons, tubes and streamline struts. Kawneer struts have been used on many planes on national and international ventures such as No. Two Travel Air which was flown in the first Ford Tour, and the Waco Ten which won the 1928 National Air Tour and the Loening Amphibians used in Major Darque's Pan-American goodwill flight.

In addition to Mr. Plym there are H. H. Heimann, vice-president and treasurer; F. R. Eaglesfield, vice-president and sales manager, and Lawrence J. Plym, secretary. The company is featuring streamline struts of various dimensions from light wing struts to heavy landing gear struts at the Chicago show. It is also featuring a new product recently introduced as "Reinforced Rib Struts."

Kreider-Reisner Aircraft Co., Inc.

The Reisner Aero Service was established at Hagerstown, Md., in 1920. In 1925 Kreider-Reisner Aircraft Co., Inc., was incorporated with A. H. Kreider as president and treasurer, L. E. Reisner, vice-president and J. K. Baker as secretary. They began immediately to operate in the aeronautical field by establishing a repair depot, and manufacturing aircraft parts. Design and construction was then started on the "Challenger," a three-place open cockpit biplane.

In 1926, the Kreider-Reisner racing monplane was the winner of the "Scientific American Trophy" at the Sesquicentennial Races in Philadelphia.

The firm is exhibiting a "Challenger" biplane with split type landing gear, low-wing ailerons and a Comet engine at the Chicago show.

The present officers are A. H. Kreider, president and treasurer L. E. Reisner, vice-president; J. K. Baker, secretary; F. E. Seiler, Jr., chief engineer. The factory and offices are located at Hagerstown, Md.

Keystone Aircraft Corp.

Keystone Aircraft Corp., plane manufacturer with headquarters in Bristol, Pa., was organized in 1920. Since that time, the company has developed a number of planes. These include the "LB-1," a single engined bomber; the "LB-3," "LB-5," "LB-5A," "LB-6" and the "LB-7" Army bombardment types. In addition, the Keystone organization has manufactured the "Pup," a Navy training plane. It also developed crop dusting equipment for Huff-Daland Dusters, Inc. The latest product is the Keystone "Patrician."

The Keystone corporation very recently effected a consolidation with the Loening Aeronautical Engineering Corp. of New York, N. Y. This merger was accomplished through the exchange of all outstanding shares of Loening stock for shares of Keystone stock. As a result, one of the strongest combinations in the aeronautical industry was produced. The Loening company was organized in 1917 and is responsible for the development of the Loening Amphibian, which is well known. This product is being exhibited at the Chicago Aircraft Show by the Loening division of the company. The plants of both companies are operated as independent units at the present time, although they are under the same general management.

The present officers of Keystone Aircraft Corp. are Edgar N. Gott, president; C. T. Porter, vice-president; C. L. Roloson, vice-president; A. P. Loening, vice-president, and L. W. Townsend, secretary and treasurer.

E. M. Laird Airplane Co.

E. M. Laird, president of E. M. Laird Airplane Co., first became interested in aeronautics in 1910, and in 1913 and 1914, he designed and built his first plane, with which he taught himself how to fly. It was this plane that he used for flying exhibitions the following year. In 1916, he built another plane, equipped with a larger engine, which was designed for stunting. This plane, it is said, was later used by Katherine Stinson in a number of exhibition flights in Japan and China. In 1917, Mr. Laird instructed Army fliers as a civilian flying instructor. In 1919, with Wm. A. Burke, Mr. Laird organized the original E. M. Laird Airplane Co. of Wichita, Kans. He later disposed of his interest and the company is now operating under another name at the present time.

In 1923, the present E. M. Laird Airplane Co. was organized, and began operations at 4500 West 83 Street, Chicago, Ill. The firm now has in production three models of commercial planes. These are the Laird-Whirlwind "LC-B," a three-passenger open cockpit type; the "LC-R," and a six passenger cabin plane powered with a "Wasp" engine. The Laird company has on exhibition at the aircraft show the Laird-Whirlwind LC-B model and the Laird-Wasp cabin plane.

The officers of the company besides Mr. Laird are Lee Hammon, vice-president, and Charles Arens, secretary. Offices and factory are located at 4500 West 83 Street, Chicago, Ill.

The Leece-Neville Co.

The Leece-Neville Co., maker of electric starting and lighting systems and voltage regulators for automobiles, trucks, buses, rail cars and locomotives, as well as for airplanes, was organized in 1909 by S. M. Neville, B. M. Leece and George S. Cole. The original address of the company was 1051 Power Ave., Cleveland, O.

In 1920, this company entered the aeronautical field, manufacturing single-voltage and double-voltage generators. The latest development of the Leece-Neville Co. is a voltage regulator generator carrying two voltages suitable for both radio, telephone and code work. Fifteen volts is the low voltage, with a current output of 25 amperes at this voltage, and 1,000 volts is the highest voltage with a current output of 700 millimeters at this voltage. This generator and the other aircraft products of the company are on display at the aircraft show.

The present address of the Leece-Neville Co. is 5363 Hamilton Avenue, Cleveland, O. The officers are S. M. Neville, president; B. M. Leece, vice-president and chief engineer, and Geo. S. Cole, secretary.

Linde Air Products Co.

Welding has been playing an increasing important part in the construction of aircraft. The equipment used is highly specialized and has been developed after much experimentation. One of the most experienced firms in this field is Linde Air Products Co., of 30 East 42nd St., New York, N. Y. This is one of a group of companies which were joined together under the Union Carbide & Carbon Corp. in 1917 for the purpose of supplying all the products necessary for welding work. Oxweld Acetylene Co., Prest-O-Lite Co., Inc., Union Carbide Co. and Haynes Stellite Co. are some of the others in the group. The Linde Air Products Co. joined the Aeronautical Chamber of Commerce this year and has been most active in its contacts in the aircraft field

Besides supplying the gases used in welding, the group supply all the accessory equipment, such as torches, generators, oxygen bottles, handling trucks, etc. The companies' engineers have specialized in studying plant production problems as far as they concern welding, and at the show giving advice on this subject to all who request it. A complete line of the most modern welding equipment with photographs of plant installations is on display. Besides this, the floodlights manufactured by the Oxweld Acetylene Co. for the illumination of airports are being shown.

Macwhyte Company

Macwhyte Company, manufacturer of streamline wires, was organized in 1900. Headquarters were established in Coal City, Ill., and the company began the manufacture of wire and wire rope. In 1918, its products were first introduced to the aeronautical industry. Since that time, the company has manufactured streamline wires and round-drawn tie rods for aircraft. It is also responsible for the development of the Macwhyte "Safe-Lock" clevis ends for both streamline and round tie rods.

The Macwhyte Company has a complete display of streamline wires, round-drawn tie rods, clevis end fittings, and aircraft cable and strand at the Chicago aircraft Show.

The present address of the company is Kenosha, Wisconsin, and the officers are Geo. S. White, president; Jessel S. White, vice-president in charge of aviation department, and H. E. Sawyer, treasurer.

Mahoney-Ryan Aircraft Corp.

The history of Mahoney-Ryan Aircraft Corp., which now has its headquarters at the Lambert-St. Louis Flying Field, Anglum, St. Louis County, Mo., may be traced back to 1922 when T. C. Ryan was "joy hopping" passengers in an old "Jenny," using a small field at the foot of Broadway, San Diego, Calif., as the base of operations.

In that year, B. F. Mahoney took a course in flight instruction from Mr. Ryan. The student invested some capital in the business, several other planes were purchased, a hangar at 232 Barnett Ave. was erected and the two became partners in the Ryan Flying Co. An airplane factory was started in one corner of the hangar, and the first Ryan "Cabin Standard" was built.

Ryan Flying Co. started a daily commercial passenger line from Los Angeles to San Diego in March, 1925. This service was operated for about a year. At the end of that time, the company turned its attention to the manufacturing end of the business. J. D. Alexander, who had been in charge of the Los Angeles field, was made sales manager. Soon after, the Ryan "M-1," a high wing, open cockpit monoplane made its appearance. This plane was designed by William Waterhouse, W. A. Mankey and W. H. Bowlus. Planes of this type performed very well with the Wright "Whirlwind" engines, and were used by mail and passenger lines in the West during the early part of 1927. Twenty-five Ryan M-1's and a later model, the Ryan "M-2," are said to have been constructed. In the meantime, Mr. Mahoney had purchased Mr. Ryan's interest in the company.

Then came the building of Colonel Lindbergh's "Spirit of St. Louis," which was the forerunner of the present Ryan "Brougham." The name of the company, which at that time was known as Ryan Airlines, was changed to the B. F. Mahoney Aircraft Corporation of California, with B. F. Mahoney as president, soon after Lindbergh's flight. This company is now controlled by the Mahoney-

Left to right: Charles H. Coburn, Pioneer Instrument Co.; Harold F. Pitcairn, president, Pitcairn Aviation, Inc.; F. B. Rentschler, president, Pratt & Whitney Aircraft Co.

Ryan Aircraft Corp., which now has its headquarters and factory at the St. Louis Municipal Airport. To date, 176 Ryan Broughams are reported to have been built and delivered. Two planes are on exhibition at the Chicago show, the 220 hp. Ryan Brougham and the new 300 hp. dual control plane.

The present officers of the company include B. F. Mahoney, president; John C. Nulsen, vice-president and general manager; P. de C. Ball, H. H. Knight and H. M. Bixby, on the board of directors.

E. B. Meyrowitz, Inc.

E. B. Meyrowitz, Inc., was organized in 1912 with offices at 104 East 23 St., New York, N. Y. E. B. Meyrowitz was president and E. P. Meyrowitz was vice-president. Shortly after its organization, the firm began the manufacture of "Luxor" goggles and binoculars for pilots.

The offices of the company are now located at 520 Fifth Ave., New York. E. B. Meyrowitz is chairman of the board; Edward P. Meyrowitz, president; Wm. N. Cook, vice-president; P. A. Meyrowitz, vice-president, and R. A. Meyrowitz, treasurer. The firm is featuring Luxor goggles and Luxor binoculars in its display at the Chicago show.

Michigan Screw Co.

Michigan Screw Co. was organized October 1, 1906, with R. E. Olds, president; R. H. Scott, vice-president; Ray Potter, secretary and treasurer, and H. B. Lundberg, superintendent and manager.

The firm entered the aeronautical field in 1917, when it began the manufacture of valve lifters, tappets and piston pins for aircraft engines. Recently, the company developed a four-cylinder-in-line, air cooled, aircraft engine, and to date, three of these engines have been completed. One of these is said to have been run 55 hr. on a test stand and 45 hr. installed in an Avro "Avian" light plane. Some slight changes are now being made, after which the engine will be placed in production. One of the first three engines is on display in the booth of the company at the Chicago Aircraft Show.

The present heads of Michigan Screw Co. are H. B. Lundberg, president and general manager; Ray Potter, vice-president and treasurer; C. R. Morris, secretary and assistant treasurer; W. H. Dahlberg, sales manager, and H. E. Morehouse, aeronautical engineer.

The Michigan Screw Co. is located on South Hosmer St., Lansing, Mich.

Mohawk Aircraft Corp.

Although this concern was organized May 1, 1927, and headquarters were established at 1821 Marshall St., N. E., Minneapolis, Minn., it was not incorporated as Mohawk Aircraft Corp. until Sept. 15 of that year, following the successful test flights of the low wing, open cockpit, sport monoplane, now known as the Mohawk "Pinto," which the company manufactures.

The first Mohawk planes met with general approval, and it soon became necessary to find other quarters so that production might be increased. Last April, the factory was moved to its present location at 2600 Delaware St., S. E., Minneapolis. In the same month, the first "Pinto" dealer was appointed. In June, the capitalization of the company was increased, and, in August, the plant was further expanded to provide an additional 30,000 sq. ft. of floor space.

The original officers of the company were Leon A. Dahlem, president; W. C. Cumming, vice-president and chief engineer; G. A. MacDonald, vice-president and chief pilot, and S. E. Whitney, secretary and treasurer. Mr. Whitney is the only one of the original executives who still holds office. The officers now are Stanley Partridge, president; R. R. Rand, chairman of the board of directors, and G. P. Murphy, vice-president.

On display at the Chicago Aircraft Show is a stock model of the Mohawk "Pinto."

Monarch Aircraft Co., Inc.

Monarch Aircraft Co., Inc., airplane manufacturer, Riverside, Ill., was founded November 20, 1927, by Arthur W. Roza, who has been connected with the industry since 1914, and Frank W. Stahle, who was formerly with the air service. At the time of organization, Mr. Roza became president and general manager of the company, while Mr. Stahle became vice-president, treasurer and test pilot. These two men still hold the same offices. Later, Florence Stahle was elected secretary.

Shortly after the organization of the company, the first "Monarch" biplane was produced, and since that time six of these planes are said to have been manufactured. This light commercial biplane is on exhibition at the International Aeronautical Exposition. The present address of the company is 92 Ogden Ave., Riverside, Ill.

Mono Aircraft, Inc.

Mono Aircraft, Inc., airplane manufacturer, Moline, Ill., was organized last March. The first model produced was the "Monocoupe," a two passenger, enclosed cabin monoplane of the externally braced, high wing type. This plane met with approval and has been in production for some time. Recently, the company developed the "Monoprep," a two passenger training plane, and the "Monocoach," another monoplane of the enclosed cabin type, designed to carry six passengers. These three planes are on exhibition at the display of the airplane manufacturing company in Chicago. The present officers of the company are W. L. Velie, Jr., D. A. Luscombe and George A. Stange.

MotoMeter Co., Inc.

The MotoMeter Co., Inc., was organized in New York City on Oct. 1, 1912, by C. H. Townsend, president; H. H. Boyce, general manager and secretary, and P. L. Veeder, vice-president and treasurer.

The company manufactured and introduced to the automotive industry the Boyce MotoMeter. The MotoMeter Co. entered the aero field in 1917 and is said to have supplied 20,000 Boyce MotoMeters for Army and Navy planes during the War.

Boyce MotoMeters were used on the NC-4 in its 1919 trans-Atlantic flight, Colonel Lindbergh's New York to Paris flight, the Army's "Round the World Flight," Commander Byrd's North Pole flight, and many other historic flights, according to the officials.

Together with its subsidiary, the Natural Gauge and Equipment Co., it now supplies the Army and Navy with practically all its indicators and a large number of aircraft pressure gauges. Boyce MotoMeters are now used by many of the leading manufacturers of commercial planes. The display at the Chicago show includes heat indicators and pressure guages.

The firm is now headed by C. H. Townsend, president; Louis C. Kurz, secretary and treasurer, and Jerry J. Tobias, vice-president. General offices are at 15 Wilbur Avenue, Long Island City, N. Y.

Moth Aircraft Corp.

The actual date of organization of the Moth Aircraft Corp. located in the Graybar Building, New York, N. Y., was May, 1928. The officers of the concern are M. M. Warren, president; Earl L. House, first vice-president; Frank M. Smith, second vice-president; Wesley Hessner, treasurer, and A. Day, secretary.

The Moth Aircraft Corp. is starting production of the de Havilland "Gipsy Moth" airplane at its plant in Lowell, Mass. It is expected that the first planes will be ready by early spring.

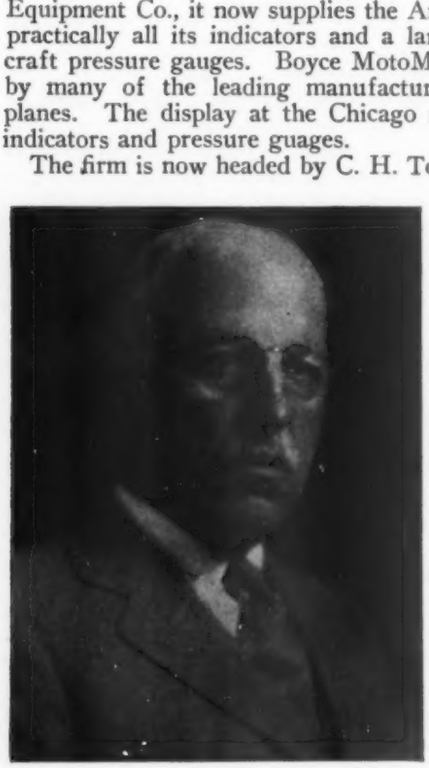
This company has, in addition to its own, the engineering and technical staffs of the de Havilland Co. at its disposal for the reason that the Moth Aircraft Corp. has been organized principally to manufacture the British planes in this country. An imported model of the Gipsy Moth is on display by this company in the Coliseum in Chicago.

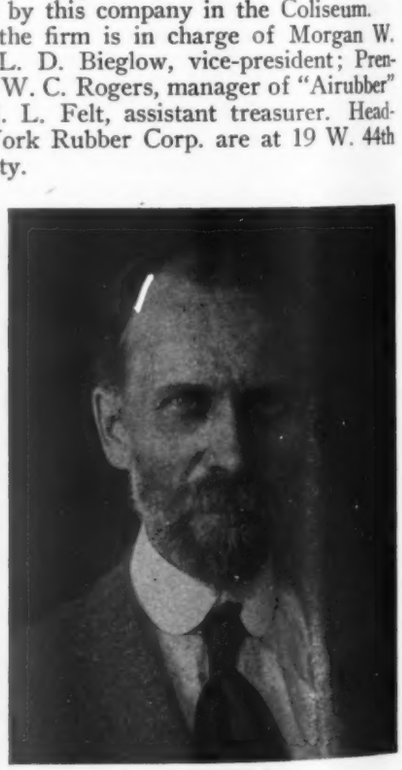
New York Rubber Corp.

New York Rubber Corp., manufacturer of belting, packing and technical staffs of the de Havilland Co. at its this firm purchased the Airubber Corp. of Chicago, together with all patents on items and manufacturing processes concerning the manufacture of air inflated goods.

Entry into the aero field began with the furnishing of air inflated cushions, life preservers, etc., to the Navy Department. The company recently started the manufacture of air cushions, air mattresses, pilot's airplane seats and life preservers for commercial aircraft builders. A recent addition to the line is an air bed, designed for plane and dirigible use, which weighs only five pounds. A complete line of all the products of New York Rubber Moth is on display by this company in the Coliseum.

Management of the firm is in charge of Morgan W. Joplin, president; L. D. Bieglow, vice-president; Prentiss Ash, treasurer; W. C. Rogers, manager of "Airubber" department, and H. L. Felt, assistant treasurer. Headquarters of New York Rubber Corp. are at 19 W. 44th St., New York City.





Left to right: Gen. W. W. Atterbury, president Pennsylvania R. R.; J. T. Trippe, president, Pan American Airways, Inc.; Spencer Heath, president, Paragon Engineers, Inc.

National Air Transport Inc.

The National Air Transport, Inc., one of the best known airline operators, was organized at Detroit, Mich. on May 1, 1925. The original officers were Harold E. Coffin, president; Chas. L. Lawrance, vice-president; Eugene W. Lewis, 2nd vice-president; Wayne C. Taylor, 3rd vice-president; John H. Mitchell, treasurer; and Carl B. Fritsche, secretary.

The firm entered the aero field May 12, 1926, starting with 10 air mail planes on contract air mail route No. 3, carrying approximately 275 lbs. of mail per day from Chicago to Dallas. It is said that N. A. T. planes now fly 6,200 mi. every day between New York-Chicago and Dallas. The Company started carrying express Sept. 19, 1927, and now operates 48 planes carrying 5,600 lb. of mail and express daily.

N. A. T. has its own repair base and maintains five divisional traffic offices. Field hangars with repair crews are at five stations besides attendants and mechanics at nine other points. National Air Transport, Inc., has also been collaborating with the U. S. Government in developing the radio beacon and plane-to-ground telephone service.

There is on exhibition at the Chicago Show, one of the N. A. T. all-metal passenger, mail and express planes.

The present officers are as follows: Earle H. Reynolds, president; Chas. L. Lawrance, 1st vice-president; C. T. Lundington, 2nd vice-president; Eugene W. Lewis, 3rd vice-president; and Paul Henderson, 4th vice-president and general manager. The company is at present located at 5936 S. Cicero Avenue, Chicago, Illinois.

Norma-Hoffman Bearings Corp.

The Norma-Hoffman Bearings Corp. originated as "The Norma Company of America" in the Bronx, N. Y., in 1911. The firm first entered the aero industry through the use of its bearings in magnetos, wind-driven generators, etc. during the World War.

The firm furnishes ball, roller and thrust bearings to the aircraft industry for aero engines, magnetos, generators, super-chargers, fuel pumps, oil pumps, reduction gears, inertia starters, controllable pitch propellers, earth inductor compasses, beacons, searchlights, etc.

Norma-Hoffman bearings are used in the "Wright," "Curtiss," "Pratt & Whitney," "Cameron," "Comet" "Caminez," "Floco," and many other well known aviation engines. Bearings are also furnished by this firm to the leading instrument manufacturers, among which are Aeromarine Starter Co., Allison Engineering Co., Delco-Remy, Eclipse Machine Co., Electric Specialty Co., General Electric Co., Leece-Neville Co., National Steel Products Co., Pioneer Instrument Co., Scintilla Magneto Co., Splitdorf Magneto Co., etc.

A representative line of bearings is on display and a number of the officers of the company are at Booths A-2 and A-3 at the Chicago Show.

The present officers of the firm, which is now located at Stamford, Conn., are W. M. Nones, president; O. P. Wilson, vice-president; Samuel Robert, secretary; H. J. Ritter, assistant secretary; and N. Bell, assistant secretary.

Nicholas-Beazley Airplane Co., Inc.

Nicholas-Beazley Airplane Co., Inc., which was founded in 1923 by Russel Nicholas and Howard Beazley, began operations by purchasing surplus Army stores of aircraft materials, engines and supplies, and marketing them on a mail order plan.

From this modest beginning, the company has grown into a half million-dollar organization. The firm now owns nine buildings, an 80 acre airport with three large hangars, a fleet of 15 planes and a training school. In addition to the business of distributing and jobbing aircraft supplies, which has increased steadily from the start, the company manufactures a complete assortment of aluminum aircraft products.

The firm now is also manufacturing the Barling "NB-3," a three passenger, open cockpit, all-metal monoplane of the low cantilever wing type, which is being shown for the first time at the show. This plane was designed by Walter H. Barling, well-known aeronautical engineer. Three large factory buildings were recently completed for the Nicholas-Beazley company. Machinery is being installed and the firm expects to start quantity production on the plane in the near future.

Two booths are occupied by the Nicholas-Beazley company, and the complete line of aeronautical supplies handled by the concern, propellers, engine parts, materials for aircraft construction and supplies used by the aviator are on display, besides the new plane.

Nicholas-Beazley Airplane Co., Inc., is still owned and operated by Mr. Nicholas and Mr. Beazley, the president and the secretary-treasurer, respectively. The present address of the firm is English at North St., Marshall, Mo.

The Packard Electric Co.

The Packard Electric Co. was organized in Warren, O., in the year 1890, by W. D. Packard, and J. W. Packard. Upon organization, it started the manufacture of automotive ignition and lighting cable and transformers.

In 1916, the firm started making ignition and lighting cable for use on aircraft. These products were used extensively on government aircraft during the World War. The company has recently established a special research department to provide the aeronautical industry with the proper cable equipment to meet the numerous requirements of aircraft and engine manufacturers. The ignition and lighting cable produced by this company are on display at the Chicago show.

N. A. Wolcott is president; B. N. Macgregor, sales manager, and L. C. Wolcott is sales engineer.

Pan-American Airways, Inc.

Pan-American Airways, Inc., was organized and began operating its original air line, from Key West to Havana, in October, 1927. This line was extended to Miami in September, 1928. During the year, there were further extensions made including Porto Rica, Nassau and Panama. In June, 1928, the Aviation Corporation of the Americas was organized as a holding company to finance all activities so as not to interfere with the business of the operating companies. It is planned to extend operations to 22 different companies in the Americas. Arrangements have been made between the Atlantic Coast Line Railroad, Florida East Coast R. R. and the Pan-American Airways, Inc., so that tickets can be purchased at any airway ticket office for transportation from any point in the U. S. to any point touched by the Pan-American Airways. When the $100,000 air terminal is completed at Miami, arrangements will be such that passengers and luggage will be aboard the air transports not later than 45 min. after leaving the Pullmans.

A fleet of tri-engined enclosed cabin monoplanes with a high-speed of 148 m.h.p., will go into operation at the inauguration of the first international air-passenger service in America.

Pan-American Airways, Inc., is displaying at the Chicago Aircraft Show a model of its Miami Airport including the new $100,000 air-rail terminal, in connection with literature and a map showng the system in the United States and Central and South America.

The officers of the company are J. T. Trippe, president; J. A. Hambleton, Geo. Mixtex, and J. B. MacGregor, vice-presidents, and Robert G. Thatch, secretary. Their offices are at 100 E. 42nd St., New York City.

Paragon Engineers Inc.

Spencer Heath, president of the Paragon Engineers, Inc., started manufacturing the first Paragon aircraft propellers at 242 Grindall Street, Baltimore, Md., in September, 1909.

According to Mr. Heath, his past achievements include the making of the propeller for the first U. S. Army dirigible in 1910; the first propeller to lift a hydro-aeroplane from the water, the three-bladed propellers used in naval operations, during 1911-12-13, and the propeller used on the trans-Andean flight in 1914.

Paragon Engineers, Inc., furnished propellers to the U. S. Signal Corps during the Mexican trouble in 1916, also large quantities of its products to the U. S. and Allied powers during the World War.

Paragon Propellers were furnished in response to an emergency order by wireless from Trepassay, N. F., for Commander's Reed's trans-Altantic flight of 1919. Successful power-operated controllable and reversible pitch propellers were designed and passed all ndurance and operation tests in 1919. During the past few years, research has been carried on in wood, steel, aluminum and composition propellers, the last being the successful development and introduction of the Monoid Interlaced Wood Fibre Moulded Propellers.

Spencer Heath is still in control of the company and is showing an exhibition of various propellers at the Chicago Show.

Parker Appliance Co.

AIRCRAFT MANUFACTURERS in many parts of the country are using tube couplings manufactured by the Parker Appliance Co. 10320 Berea Road, Cleveland, O. The company also produces fuel line cocks, flow indicators, pressure relief valves, tank flanges and other aircraft fuel distribution units so that a complete system can be designed using Parker parts. A full line of hand and production tube benders is also included in the products of the company as an aid to uniform installation of fuel systems.

Parker tube couplings are light in weight and sturdily built and are so designed that a tight metal to metal joint can be made even if the tube is carelessly flared. The coupling nut serves as a die in flaring the tube which is also expanded below the flare by the flaming tool so that vibrational strains are absorbed in the coupling and not imposed on the flared end of the tube. The seat of the coupling and the nose of the nut are slightly molded (within the tensile strength of the metal) so that a secure and tight joint is made. Aluminum tubing can be properly joined by the use of Parker couplings.

These couplings are manufactured in many sizes from No. 2, for ⅛ in. O. D. tube to No. 48, for 3 in. tube. For aeronautical installation standard brass or aluminum couplings are recommended. These are made in the standard weight in 16 general shapes with many possible variations of these shapes. Special shapes also can be furnished as required.

The company has been manufacturing these products for the aeronautical industry during the past five years. Distribution and service is being extended throughout the country.

The Phister Manufacturing Co.

The Phister Manufacturing Co. has been turning out a fire extinguisher especially adapted to aircraft use since 1923. The apparatus is turned on by a lever which is controlled by the pilot. The fire extinguishing liquid is piped under pressure and sprayed at all points in the fuselage and engine mount where fire is apt to occur. The equipment is used by both the Army and Navy and as normally used weighs about eight pounds and contains some 16 ft. of copper tubing.

The company was organized originally in 1920 and its main offices are at 901 Broadway, Cincinnati, O. The officers are B. H. Phister, president; F. B. Stegeman, vice-president; A. V. Stegeman, secretary, and A. B Phister, treasurer At the show the company is exhibiting a line of fire extinguishers suitable not only for use on aircraft, but also for use around hangars.

Parker Appliance Co.

The Parker Appliance Co., 10320 Berea Road, Cleveland, O., was organized in 1924 and immediately began the manufacture of "Parker" tube couplings. These couplings met with success, both in the military and commercial fields. They are used by the Navy Department as well as by a number of the leading manufacturers of commercial aircraft. Parker fuel distribution fittings were later introduced by the Parker Appliance Co., and these also are found in many types of planes.

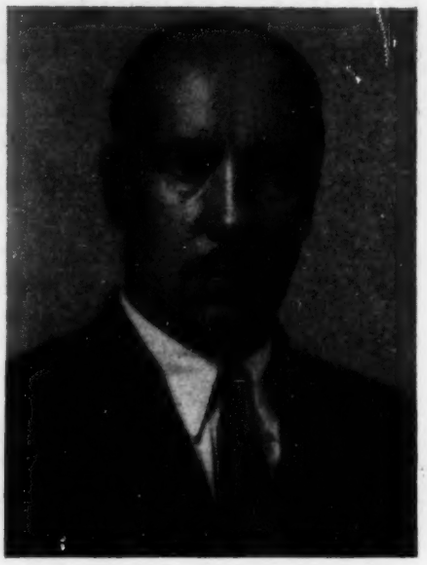
Both the tube couplings and the fuel distribution fittings made by the company are on display this week in Chicago. In addition, the tube bending and tube fabricating tools are being shown. The Parker company is owned and operated by A. L. Parker.

Pennsylvania Railroad

John Stevens, builder of the first practical locomotive, is called the father of the Pennsylvania Railroad. The original charter was issued by the State of Pennsylvania to the Philadelphia-Columbia Ry. Co. in 1823, and under this charter, the first division of the Pennsylvania Railroad was built by the State of Pennsylvania. This consisted of a short piece of track, which was laid by the State, from Philadelphia to Columbia, Pa. and completed in 1834 at the cost of $3,000,000. In the meantime, a new charter was issued in 1828 which first designated the name of the company as the Pennsylvania Railroad Company. The present organization was incorporated in 1846 and extended the line to Pittsburgh by buying a private railroad from Columbia to Harrisburg, purchasing the original stock from the State and building the Harrisburg to Pittsburgh division which was completed in 1857. Progress has steadily increased during the last century, additional lines have been added to build up this now gigantic system.

Officials of the Railroad have long been anticipating commercial flying as a transport development of the future. Early in the present year, the Pennsylvania Railroad and leading aeronautical and banking interests formed the Transcontinental Air Transport, Inc., for the purpose of establishing a combined air and mail route from New York to Los Angeles and San Francisco.

Prominent men in the aeronautical industry were retained and are now selecting landing fields, flying per-



Left to rights—T. Z. Fagan, vice-president, Scintilla Magneto Co., Inc.; B. Russell Shaw, B. Russell Shaw Co., Inc.; Igor Sikorsky, vice-president, Sikorsky Aviation Corp.

sonnel, equipment and forming schedules. The route decided on enables a passenger to travel from New York to Columbus, Ohio, by Pullman, from Columbus, Ohio, to Dodge City, Kansas, by air; from Dodge City to Los Vegas, N. Mex., the following night by Pullman; and from Los Vegas to Los Angeles or San Francisco by air.

A unique exhibit is at the Chicago show. The exhibit consists of an oil painting entitled "Harnessing the Plane to the Iron Horse," resort and travel literature and the pamphlet entitled "Linking Air and Rail Transport" is being handed to visitors by representatives of the Freight and Traffic Departments.

The present president of the Pennsylvania is Gen. W. W. Atterbury. General offices are at Philadelphia, Pa.

Pioneer Instrument Co., Inc.

Anticipating the demand that would soon be created for accurate aircraft instruments, Charles H. Colvin, Brice H. Goldsborough and Morris M. Titterington organized the Pioneer Instrument Co., Inc., on March 1, 1919. They immediately entered the aero field by supplying aircraft manufacturers and operators with instruments. Possibly the best known of the products are the bank and turn indicator, climb indicator and the earth inductor compass. A few of the other products are Air-Speed Indicator, Air Distance Recorder, Altimeter, Magnetic Compass, Flight Indicator, Fuel Sight Gauge, Fuel Flow Motor, Fuel Pressure Gauge, Landing Lights, Navigation Lights, Octant, Oil Pressure Gauge, Speed and Drift Meter, Tachometer, Thermometer, Venturi Tubes, etc.

Many of the officers are attending the Chicago Show where the company has a most complete display. The unique features of this display are dash-boards, showing all dials in uniform diameter of two and three-quarter inches. The difficulties of constructing all instrument barrels in the standard sizes are overcome after ingenious efforts on the part of the engineers. A complete set of instruments is shown for the first time in their new sizes including Air Speed Indicators, Altimeters, Tachometers, Climb Indicators, Earth Inductor Compass, Controller and Indicator Guides, Turn and Bank Indicators, Fuel Level Gauges and clocks. Cabin panels are also shown designed with Air Speed Indicators and Altimeters having six-inch dials and clocks with large faces. These instruments are designed for use in transport planes and are mounted in front of the cabins, making them visible from the rear seats. A working model of the earth inductor compass, simulating its operation in a moving plane, is also exhibited at the Pioneer booth.

The present officers of the company are Chas. H. Colvin, president and general manager; Henry F. Colvin, vice-president; Hermon F. Owen, treasurer, and B. Davis, secretary. Pioneer offices are now located at 754 Lexington Ave., Brooklyn, N. Y.

Pitcairn Aviation, Inc.

Harold F. Pitcairn organized Pitcairn Aviation in 1925, with offices at 1828 Land Title Building, Philadelphia, Pa. A factory and airport was established at Willow Grove, a suburb of Philadelphia, where design and experimental work was started on experimental planes. The company to date has manufactured a number of different types including the Pitcairn Hop Ship PA-1, Pitcairn Sesqui Wing PA-2, Pitcairn Orowing PA-3, Pitcairn Fleetwing PA-4, Pitcairn Mailwing PA-5, and the Pitcairn Super Mailwing PA-6.

In 1927, Pitcairn Aviation was incorporated to operate the New York-Atlanta and the Atlanta-Miami contract air mail routes. The New York-Atlanta service was inaugurated May 1, 1928, and the Atlanta-Miami service to be inaugurated December 1, 1928. Five subsidiary Pitcairn companies are operating in the States of Pennsylvania, Virginia, North Carolina, South Carolina and Georgia.

The firm will show a Pitcairn Super Mailwing, type PA-6, at the Chicago Show.

Harold F. Pitcairn is still at the helm of the company and it continues to maintain its office at 1828 Land Title Building, Philadelphia, Pa.

The Plycor Company

The Plycor Company was organized on May 1, 1927 with the following officers: Dr. Eugen von Maltitz, president; Edmund von Maltitz, secretary and treasurer; and Mrs. Marie E. Vines, general manager. The company immediately entered the aero field by supplying plywood to aircraft manufacturers from its factory at 1524 So. Western Ave., Chicago, Illinois.

The Plycor Company and its associates have been manufacturing Birch plywood of a very high quality for many

years. The European mills are said to supply the bulk of the plywood for continental airplanes. Although "Plycor" has only been known to the American industry since 1927, it has been adopted by a number of our largest airplane builders. This firm has unlimited facilities for producing plywood. The AA-1 quality plywood is made without seams on either side while the standard quality is made with one seam on one side and two seams on the other.

The general manager states that the company has planned, during the coming year, to put on the market plywood with birch core and alder faces.

The company is exhibiting at its booth in the Chicago Aircraft Show samples of its birch plywood.

The present address and the officers are the same.

Pratt & Whitney Aircraft Co.

The Pratt & Whitney Aircraft Company was organized at Hartford, Conn., in August, 1925. The original officers, F. B. Rentschler, president, and G. J. Mead, vice-president, immediately started research and experimental work on the present "Hornet" and "Wasp" aircraft engines. The "Wasp" engine was installed in both the land plane and seaplane which holds the world's altitude records. They are now standard equipment on Navy single and two-placed fighting planes. Pratt & Whitney engines are used by the Boeing Air Transport over the Chicago-San Francisco contract air mail route.

The officers of the company state that they originally entered the aero field in view of supplying engines only to the U. S. Government, but now furnish engines to many of the leading commercial aircraft builders. Pratt & Whitney engines hold 12 world altitude and speed records.

The Pratt & Whitney Aircraft Co. occupies a large middle space in the south end of Central Hall at the Chicago Aircraft Show and in this approximately 800 ft. of space is exhibited the Wasp, the Hornet, the reduction-geared Hornet and a representative stock of the parts showing the careful workmanship and interior finish of the engines. Foremost among these parts is a crank-shaft and connecting rod assembly, complete with pistons, accessory gears, and propeller hub. This gives the public an idea how the radial engine works and at the same time shows engineering authorities the fine points of the crank-shaft and connecting rod design practiced in the construction of high-powered radials. The engines on display are of the latest type and incorporate all the new features developed by the Research Department of the Pratt & Whitney Company. The most notable external features are those having to do with cylinder and carburetor accessory devices.

The 12 world records which the "Wasp" and "Hornet" have established are graphically described by a background of picture panels which also show the part taken by the organization in commercial air mail and transport work.

The present officers of the company are F. B. Rentschler, president, G. J. Mead, vice-president; and C. W. Deeds, secretary and treasurer. The factory is located at 450 Capitol Avenue, Hartford, Conn.

Posey Manufacturing Co.

The Posey Manufacturing Co., Hoquiam, Wash., was organized 1909 with J. V. G. Posey as president and manufacturer and Mrs. J. V. G. Posey as treasurer. This company entered the aeronautical industry in 1913 when it introduced Sitka spruce as material for wing beams. The firm has added numerous spruce products to its line until now it manufactures a complete line of spars, ribs, ailerous, longerons, cap strips, leading edges and spruce veneer. The company is exhibiting its line at the Coliseum in Chicago during the International Aeronautical Exposition.

It is the claim of the company that it has given wings to many world-known planes including the "Spirit of St. Louis," the "Pride of Detroit" and the "Woolaroc."

Mr. Posey is now treasurer and manager and H. O. Galloway is work's manager and secretary.

Purox Company

Purox Company, Division of Compressed Gas Corp., was organized in 1916, and has been manufacturing Purox welding and cutting torches and regulators, together with all equipment. In 1923, the company entered the aeronautical field, featuring the Purox "OO" torch equipped with a special Douglas front end and tips.

This product is especially adopted for aircraft work and has been used extensively in the industry since it was

Left to right:—Maj. Frank Robertson, vice president, Robertson Aircraft Corp.; R. A. Rearwin; J. M. Russell, vice president, Russell Parachute Co.

first introduced. Purox Company is also responsible for the application of "Stoodite," which is an extremely hard metal, to tail skids. In its exhibit in Chicago, the company is displaying Purox torches and "Metal Master" regulators.

The original officers of the concern are still at the helm. They are C. O. Epperson, president; W. E. Porter, vice-president, and J. C. James, secretary. The headquarters of the Purox Company are located at 2101 Blake Street, Denver, Colo.

Pyrene Manufacturing Co.

The Pyrene Manufacturing Co. was incorporated with offices at 34 West 33rd St., New York City, in 1909. The officers, Peter L. Wilbur, president; George M. Shaw, vice-president; Otto Kelsey, treasurer; and Edward H. Davidson, secretary, started at this time the manufacture of "Pyrene" fire extinguishers in its factory at 415 East 31st St., New York.

"Pyrene" was first used in the aero field in 1917. These extinguishers were included in the equipment of Commander Reed's trans-Atlantic flight in 1920, Commander Byrd's Arctic and trans-Atlantic flights and are installed in the three planes of his present Antarctic expedition. Pyrene extinguishers are now the standard equipment of many commercial aircraft builders.

Besides the internationally known standard one quart, double action Pyrene fire extinguishers, the Pyrene engineers have now perfected two special pressure type, remote control airplane extinguishers. They were designed for lightness, dependability, efficiency and ease of operation, with complete control of the Pyrene fire extinguishing liquid. They manufacture a type of Pyrene hand fire equipment for all hazards, also automatic Phomene (foam) Accumulators for manufacturing, air field and other aircraft protection.

The company has on exhibition a complete line of fire equipment suitable for the protection of all fire hazards in the aircraft industry at booth X-17 in the Chicago Show.

Officers of the company, which is now located at 560 Belmont Ave., Newark, N. J., are E. J. Waring, vice-president, and E. A. Clapp, secretary and treasurer.

Quaker State Oil Refining Co.

Quaker State Oil Refining Co. was organized at Oil City, Pa., the present address, on June 1, 1913. The firm manufactures Quaker State medium and heavy engine oils and a line of greases. Of these products, the triple-distilled engine oils are recommended by the company for use in aircraft engines. A complete display of Quaker State products are exhibited at the Chicago show. Present officials of the company are S. Messer, president; J. D. Berry, vice-president; G. B. Hunder, secretary, and C. B. Berry, treasurer.

Rand McNally & Co.

Rand McNally & Co., one of America's oldest commercial map engravers and publishers, was originated by Wm. H. Rand, president, and Andrew McNally, vice-president, in 1864. The first activity of Rand McNally & Co., was the operation of a job-printing office at 165 North Park St., Chicago, Ill. Map-engraving and printing gradually increased with this firm until the advent of the automobile caused this department to be the most important line of endeavor.

Rand McNally maps have been used by aviators for many years. At the present date, the firm manufactures maps for aviators, atlases and maps for aviation executives, and air passenger tickets and advertising folders.

The exhibit at the Chicago Show includes aviation maps, air passenger tickets and advertising folders for air lines and aviation companies. The company is announcing at the Show a new series of State Air Trails Maps, the first of its kind ever published. This series will include individual maps of every State showing landing fields, beacon lights and giving much other valuable aeronautical information.

The officers of the company are H. B. Clow, president; F. L. McNally, vice-president; Andrew McNally, secretary; and Gustave Hessert, treasurer. The present address is 536 South Park Street, Chicago, Ill.

R. A. Rearwin

R. A. Rearwin has been well known in the lumber, coal and petroleum products business in Salina, Kansas for a number of years. Although interested in aviation during the decade, he has only been actively engaged in the aero field since June 20, of this year. At this time, he secured Fred Landgraf, formerly of the Travel Air Manufacturing Co., and started experimental work on an open cockpit biplane.

Mr. Rearwin is showing this plane at the Chicago Show. Immediately after the show, additional machinery will be installed and production will be started on this model. The Engineering Staff with Fred Landgraf, as chief engineer, and J. J. Clark and Wm. Guselmann, as assisting engineers, are now working on the designs of a larger cabin monoplane to be put into production in early 1929.

To date, the enterprise is owned by R. A. Rearwin, whose factory is located at 244 Santa Fe Avenue, Salina, Kansas.

Robertson Aircraft Corp.

The original officers of the Robertson Aircraft Corp., a flying service organized in St. Louis, Mo., on April 25, 1919, were Maj. William B. Robertson, president; Frank Robertson, vice-president, and Harry H. Perkins, secretary and treasurer. This firm entered the air mail service in 1925 when it secured the mail contract between St. Louis and Chicago in May of that year. A passenger line over the same route was started on Aug. 20, 1928.

This firm was reorganized on November 1 of this year as a part of the Universal Airlines. F. Robertson is now the president while Mr. Perkins is secretary and George Schierberg, treasurer. The company has a booth at the International Aeronautical Exposition in Chicago where full particulars regarding its service may be obtained.

Russell Parachute Co.

Russell Parachute Co., manufacturer of the Russell "Lobe" parachute with headquarters at 1202 Kettner Boulevard, San Diego, Calif., is exhibiting its line of parachutes, helmets and parachute flares at its display in the Coliseum.

This company was organized in December, 1925, with H. R. McClintock as general manager and J. M. Russell, engineer. The firm started production of its first parachutes January 1, 1926. Since that time, the company has added parachute flares, helmets and also tow targets to its line.

The Russell parachute is now used extensively in commercial aviation. A number of these parachutes have likewise been supplied the Army and Navy for test purposes. In Europe, the business is going on apace. Recently, the Russell company licensed the British Russell

Parachute Co. of London, England, to manufacture and sell the Lobe parachutes to the European market.

The present officers of the American company are H. R. McClintock, president; J. M. Russell, vice-president, and C. C. Temple, secretary. The address is the same as formerly.

John A. Roebling & Sons Co.

John A. Roebling & Sons, Co., was originated by John A. Roebling in 1840, and since this time, has manufactured wire, with executive offices and factory at Trenton, N. J. Roebling entered the aero field approximately 20 yr. ago by supplying wire to the pioneer fliers and aircraft business. This firm came to the front by its large production of wire aircraft products for the United States and Allies during the World War. Among its developments are listed balloon cables with telephone wire centers for communication with captive balloons, mooring lines for larger dirigibles, welding wire for the welding of modern fuselages made of chrome molydenum, suitable wire for bonding and for aircraft aerials also special shielded power, ignition and lighting cables.

The exhibit at the Chicago Show includes all of the company's wire aircraft products.

The present officers of the company are F. W. Roebling, Jr., president and treasurer; W. A. Anderson, 1st vice-president and general manager; Siegfried Roebling, 2nd vice-president; A. C. Cooley, Secretary and general sales manager; F. W. Bunn, chief engineer; and F. J. Maple, advertising manager. The address of the firm is at Trenton, N. J.

Scintilla Magneto Co., Inc.

In 1914 the Scintilla Magneto Co., was organized by a group of engineers in Soleure, Switzerland, as a result of an emergency created by the outbreak of the World War. Success attended the efforts of the company and in 1921 it had won a prominent place in the record of European performances. In 1921, the Scintilla Magneto Co., Inc., was formed with offices and laboratories in New York City, and by 1925 the popularity of the Scintilla Aircraft Magneto had been well established.

Following the acceptance of the magneto by the United States Government and the aeronautical industry, it became essential that a factory be established in this country.

The American-owned and operated factory of the Scintilla Magneto Co., Inc., started operations at Sidney, N. Y., in 1925. The first American-built Scintilla Aircraft magnetos were delivered in November, 1926. In 1922, the firm supplied a few magnetos for Wright "E" engines. At this time, officials state that they are supplying approximately 95 per cent. of the ignition used on American aircraft engines.

The company's exhibit at the Chicago Show consists of a display cabinet upon which are mounted a Type V-AG9-D Scintilla Aircraft Magneto, which is the ignition equipment of the Wright "Whirlwind," "J-6" and "Cyclone"; the Pratt & Whitney "Wasp" and "Hornet"; and other nine-cylinder aeronautical engines. Also a type MN 7-D Scintilla Aircraft Magento which is the ignition equipment of Kimball "Beetle," the Warner "Scarab," the Aircraft Engine Company's "Comet," the Axelson Machine Company's "Axelson," etc. These two magnetos are operating and delivering high tension current to spark gaps.

In the center and slightly to the rear of these two magnetos, raised on a pedestal, is the new Scintilla Vertical Double Aircraft Magneto, Type SC. This magneto is also in operation delivering high tension current to two unique spark gaps. There are also various type magnetos and their parts displayed in the rough, semi-finished and in a finished state. Switches, and other ignition equipment are also on display.

The present officers are W. H. Flook, president; H. Hanni, vice-president; T. Z. Fagan, vice-president, and G. E. Steiner, secretary and treasurer. The company's address is Sidney, N. Y.

S K F Industries, Inc.

S K F Industries, Inc., was organized by a group of engineers at Gothenberg, Sweden, in 1908, where the manufacture of S K F ball and roller bearings was started. The corporation now has 10 factories located in the United States and foreign countries. It has four research laboratories, its own mines, and its own forests in Sweden, from which the wood comes to make Swedish charcoal steel. From the time the ore is taken from the mine, it is under constant supervision until the finished bearings are completed.

S K F bearings are said to have been used in the aero field since the construction of the first aircraft engines. Their use has been standardized by a number of the leading aircraft engine manufacturers. These bearings have contributed to many of the epoch making flights, including trans-Atlantic flights by planes and dirigibles. Four hundred sixty-five S K F bearings were in the five engines that propelled the Graf Zeppelin, according to officials of the company. Numerous types of aviation equipment and accessories are on display in which S K F ball and roller bearings are used in Booth "B-27" and "B-28" at the Chicago show.

The corporation's officers are W. L. Batt, president; S. B. Taylor and R. F. Runge, vice-presidents; R. H. DeMott, sales manager, and C. H. Burr, secretary and treasurer. General offices are located at 40 East 34th St., New York, N. Y.

Screw Machine Specialty Co.

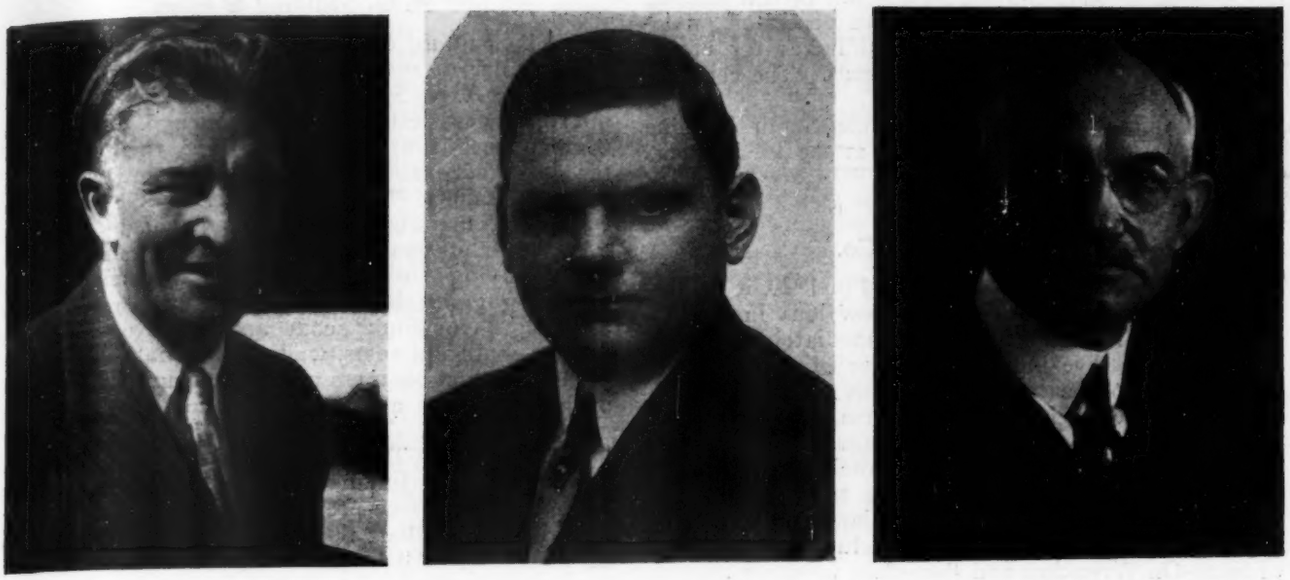
The Screw Machine Specialty Co., 214 W. Ontario St., Chicago, Ill., manufacturer of screw machine products for some time, turned its attention to the aeronautical field a little over a year ago. Activity was started by doing special work but it was soon discovered that a market for standard forked end bolts existed. Quantity production was started on these and the products found a ready sale in the industry. Since that time the company has been working on a number of other items including the Oleo landing struts, brakes, wheels for replacing tail skids, ball and socket and universal joints, streamline hub caps, cowling studs, and stabilizer adjustments. A complete line of these products is on display at the International Aeronautical Exposition in Chicago.

B. Russell Shaw Co., Inc.

The B. Russell Shaw Co., Inc., airport engineers and contractors, of 1664-1666 Arcade Building, St. Louis, Mo., was incorporated August 1, 1927, by L. O. Stocker, B. Russell Shaw and A. Y. Shaw.

The company's activities in the aero field started in 1908 with the manufacture of aeronautical instruments and planes. During the last several years, the company has designed and constructed a number of airports and air terminals throughout the United States.

This firm is showing a modernistic model of an air



Left to right:—Edward Stinson, Stinson Aircraft Corp.; W. L. O'Neill, vice-president, Stromberg Motor Devices Co.; W. B. Mayo, vice-president, Stout Metal Airplane Co

terminal. The display shows all improvements, is unconventional in design and the buildings show the present futuristic vogue of architecture.

The company is managed by its original officers, B. Russell Shaw, president; L. O. Stocker, vice-president, and A. Y. Shaw, secretary and treasurer.

Siemens & Halske A. G.

Siemens & Halkse A. G. was organized in 1846 by Werner von Siemens. The address of the company at that time was Berlin-Siemensstadt, Germany. In 1906, the concern first entered the aeronautical industry when it constructed a dirigible. In 1912 the attention of the company was turned to aircraft engines. The first engine produced by the concern was a five cylinder rotary. This was followed in 1914 with a nine cylinder engine, which developed 110-115 hp. Later an 18 cylinder and an 11 cylinder engine were constructed. The present types of static radial engines manufactured by Siemens & Halkse were developed in 1924, but were not tested and placed on the market until 1925.

Siemens and Halkse recently appointed Dr. K. G. Frank, consulting engineer with offices at 75 West St., New York, N. Y., as general representative to handle all the business of the company in the United States. Dr. Frank is exhibiting the engines made by Siemens & Halkse this week at the aircraft show. Two new engines are on display. These are the "Sh 13" and "Sh 14," which have five and seven cylinders respectively. They are similar in design and construction to the "Sh 10" and the "Sh 11," except that they have an improved cylinder with a bore about 1/8 in. larger than the earlier types. The "Sh 12" and some larger engines developed by the German manufacturer are also on exhibition.

Sikorsky Aviation Corp.

Sikorsky Aviation Corp. was organized by the present officers, A. C. Dickinson, president; W. A. Bary, vice-president and production manager; and Igor Sikorsky, vice president and chief engineer, in 1928. Although acquired and given its title in the present year, the company has been operating in the United States for several years. Igor Sikorsky, who lends his name to the organization, has enjoyed a long and active career in European aeronautics. The history of Mr. Sikorsky's aeronautical activities started in Russia and date back to his early experiments with helicopters and his first planes the S-1, S-2 and the S-3, during 1908-09-10.

In 1912, he is said to have received the highest award in the Moscow Aviation Exposition with his S-6A plane. Also winning in the Fall of the same year, the first prize in the Petrograd Military Competition with the S-6B plane. In 1913, he began building multi-engined planes which, as improvements were added, increased in size until flights were made by a four-engined plane of 17,600 lb. gross weight. During the War, Mr. Sikorsky furnished planes to the Russian Government. He came to the United States in 1919 and in 1923 organized the Sikorsky Aero Engineering Corporation.

A number of planes were built by this organization until it was acquired by the newly formed Sikorsky Manufacturing Corp. in 1925. This company moved its quarters from Roosevelt Field, L. I. to the present location at College Point, L. I., where it now occupies a building of more than 40,000 sq. ft. Many models of single and multi-engined planes including land planes, sea-planes and the Amphibion have been built by the company during the last three years.

An Amphibion type S-38 is on display at the Sikorsky booth at the Chicago Aircraft Show.

Smith Welding Equipment Corp.

Smith Welding Equipment Corp. is a well-known manufacturer of all types of Oxy-Acetylene welding and cutting equipment. About 15 yr. ago Elmer H. Smith organized the Northern Welding Co. for the manufacture of Vulcan torches. The firm was purchased in 1916 by a group of eastern capitalists and the name was changed to Smith's Inventions, Inc. Under this name the firm continued to prosper and in December, 1917, the firm was again reorganized under the name of Smith Welding Equipment Corp.

In 1920 the company created the first air and oil preheating torch. Then in 1923 it introduced "A-Mal-Gam" a special flux for welding cast iron with bronze. At the present time the firm manufactures all types of welding

and cutting outfits, soldering equipment, carbon burning assembly for use in engines, acetylene generators, welding regulators, welder's glasses, and fluxes for use in welding or soldering all types of metals. The company also has a line of instruction.

A selection of the products of the Smith Welding Equipment Corp. is being exhibited at the International Aeronautical Exposition in Chicago.

Snap-On Wrench Co.

When this company was founded in 1920, it originated and introduced an entirely new idea in wrench equipment. These tools were immediately accepted by the automotive industry because of their greater adaptability to intricate and difficult nut turning operations. The engineers of the firm, after a careful study of the wrench requirements for the efficient assembly and maintenance of airplanes, have recently developed many special wrenches to meet the individual wrench needs of various large companies in the industry. These new tools include special types of Snap-On Wrenches and Boxocket wrenches.

Branch warehouses and offices are now located in twenty-six of the principal cities of the United States and Canada with an export department in New York.

Snap-On socket wrenches, Blue Point Boxocket wrenches and other quality hand tools are now being shown at the Chicago Show.

The Snap-On Wrench Co. is managed by Stanton Palmer, president, N. E. Tarble, vice-president and sales manager, Jos. Johnson, vice-president and treasurer and W. A. Seidemann, secretary.

The concern now has three manufacturing plants in Milwaukee, Wis. The general offices are at 14 E. Jackson Blvd., Chicago, Ill.

Simplex Aircraft Corp.

The Simplex Aircraft Corp. was organized by a group of prominent Ohio business men on Feb. 15, 1928, at Defiance, O. E. J. Allen is president, F. W. Allen, vice-president, and G. H. Roberts is secretary-treasurer.

This firm manufactures the "Red Arrow" monoplane which is built in two models—an open plane and a cabin plane. Two planes are being exhibited by this company at the Chicago show.

A. G. Spalding & Bros.

A. G. Spalding & Bros., well-known manufacturer and retailer of sporting goods, was founded in 1876 by the late A. G. Spalding, and Albert Spalding. Headquarters were established in Chicago, Ill., and the company began operation. In 1912, the concern entered the aeronautical field with the introduction of its first helmets. Since that time, the line of aviation equipment manufactured by the company has been expanded continually and now includes summer and winter flying suits, helmets of all varieties, face masks, goggles, leather gauntlets and mittens, the Spalding "Non-Sink" coat and the Non-Sink suit, leather coats and vests, waders and boots.

The aviation business of the company grew to such proportions that a separate aviation department became necessary. This division is now presided over by H. R. Hart. The present officers of A. G. Spalding & Bros. are Julian W. Curtiss, president; Boardman Spalding, vice-president; C. F. Robbins, vice-president and Albert Spalding, chairman of the board of directors. Albert Spalding was originally vice-president and A. G. Spalding, president. The general offices of the company are now situated at 105 Nassau St., New York, N. Y., and branches are maintained in the principal cities of the world.

The Spalding company has exhibited its line of aviation equipment in the most important of the aircraft shows that have been held in the last few years. In its booth at the Chicago show, the latest creations in aviation clothing may be seen.

Spartan Aircraft Co., Inc.

The Spartan Aircraft Co., Inc., was organized on Jan. 17, 1928, at Tulsa, Okla., with W. G. Skelly as chairman of the board of directors; Willis C. Brown, president, and F. T. Hopp, secretary-treasurer. This firm is the outgrowth of the Mid-Continent Aircraft Co. which was organized in 1926.

A new plant was constructed this past summer which, it has been said, is one of the most modern and complete commercial aircraft factories in the United States. The Spartan airplanes will be manufactured in this factory. In June, 1928, the firm obtained North American manufacturing and distributing rights for the Walter air cooled, radial engine which is made at Prague, Czecho-

Left to right: Stanton Palmer, president, Snap On Wrench Co.; Allen Jackson, vice president, Standard Oil Co. of Indiana, Lloyd Stearman, president, Stearman Aircraft Co.

Slovakia. This type of engine has, in the past two years, established nine world's records. Plans are under way for additional buildings to be used in the manufacture of the Walter engine in this country.

The company is exhibiting two Spartan biplanes, model C-3; and three Walter engines, the five, seven, and nine cylinder models. In addition, it is showing airplane and engine parts in this display at the Chicago show.

Standard Oil Company of Indiana

The Standard Oil Company of Indiana is an old established concern. This firm, which has been producing lubricating oils and all the by-products from the crude mineral oil for many years, has been identified with the aero industry almost since the beginning of man's first flight. Standard airplane engine fuel and lubricants and a line of greases are show in Booth "Y-2" at the Chicago show.

The corporation purchased the "Stanolind", a Ford three-engined plane, which made its maiden flight from Dearborn, Mich., to Chicago, Ill., on May 21, 1927, the same day that Col. Charles A. Lindbergh landed at Le Bourget Field, Paris, France. The plane is used by the officials of the company to save the time which would be consumed were it to utilize any of the slower forms of transportation. The plane is used also to advertise the aviation department of the company. The Standard Oil plane has flown in the 16 mo. period from May 21, 1927, to October, 1928, 76,491 mi., and has carried 5,988 passengers. A brick hangar is maintained by the company at the Chicago Municipal field, which houses the Stanolind and also the company's Laird biplane.

The present officers of the Standard Oil Company of Indiana are Robert W. Stewart, chairman of the board of directors; Edward G. Seubert, president; Beaumont Parks, Allan Jackson, R. H. McElroy, and E. J. Bullock, vice-presidents; Amos Ball, general manager and sales director; R. E. Humphreys, director and assistant general manager of manufacturing; L. L. Stephens, director and general counsel, and C. J. Barkdull, director and treasurer. General offices are located at 910 South Michigan Blvd., Chicago, Ill.

Star Aircraft Co.

The Star Aircraft Co., Bartlesville, Okla., was organized in May, 1928. John Kane is president; "Billy" Parker, vice-president and general manager, and John Bane, secretary and treasurer.

The company has been conducting extensive flight tests of a two passenger cabin monoplane which it built during the past summer and it is expected that actual production will be started in January, 1929. The officers of the firm expect to finish on the average of five airplanes a week after production has once been started. The plane is known as the "Cavalier" monoplane.

The Star Aircraft Co. is displaying the Cavalier at the International Aeronautical Exposition in Chicago.

Standard Steel Propeller Co.

Standard Steel Propeller Co., airplane propeller manufacturer, which maintains its factory and general offices at 221 West 7th St., West Homestead, Pa., was incorporated in 1919. It commenced the manufacture of propellers, similar in design to the types now being produced, in 1921. The products of the company have met with great success and are now used quite extensively. The progress of the Standard Steel company, aside from the merits of its products, is said to be due largely to the ability and aggressiveness of Harry A. Kraeling, who has been the president and general manager of the firm since it was first incorporated.

Standard Steel Propeller Co. is occupying two booths at the International Aeronautical Exposition in Chicago. On display there may be seen a three-bladed propeller suitable for use on a Pratt & Whitney "Wasp" engine. Besides this, the company is exhibiting the original propeller used on the Lockheed Vega "Yankee Doodle" in making its record breaking flight from Los Angeles to New York. Several standard propellers for Wright "Whirlwind" engines, Curtiss OX-5 and other lower powered engines are also on display.

Stearman Aircraft Co.

The Stearman Aircraft Co. commenced building planes in Venice, Calif., on Oct. 1, 1926. The officials who founded the organization were Lloyd Stearman, president; Mac Short, vice-president; George Lyle, secretary; Lewis G. Sinning, assistant secretary, and Fred D. Hoyt, treasurer.

A little over a year ago, the factory was moved from Venice to Wichita, Kansas. When first organized, the company produced one Stearman biplane per month, employing a force of only eight men. The company is now building two models of Stearman planes, the C-3B, which is a three-place, open cockpit biplane, and the C-3MB, which is a conversion of the open cockpit model to accommodate mail. The C-3MB model is now being used by five contract mail operators. The Stearman Co. is now building three light transport type Stearman planes for the Robertson Aircraft Corp. of St. Louis. These planes will accommodate four passengers and 500 lb. of mail. They will be powered with a Wright Cyclone engine. High-speed planes are also being constructed for Varney Air Lines, these models being exclusively mail carriers.

The present factory has floor space of 40,000 sq. ft. and four planes are produced each week by the 190 employees.

The Stearman Aircraft has on exhibition a Stearman biplane C-3B model, and a Stearman mail plane at the Chicago Show.

Stout Metal Airplane Co.

Stout Metal Airplane Co., plane manufacturer of Dearborn, Mich., was acquired by the Ford Motor Co., well-known maker of automobiles, trucks and tractors with headuarters at Fordson, Mich., Aug. 1, 1925. Since that time the airplane manufacturing company has been operated as a division of the Ford company.

The first model produced by the Stout company, after the acquisition by the Ford Motor Co., was the "4AT," a transport cabin monoplane of the high wing type, with a thick wing section. Planes of this type, which are still in production, are now in use on a number of airlines throughout the country. The 4AT is constructed entirely of duralumin, and is powered with three Wright "Whirlwind" engines. It has a capacity of from 10 to 12 passengers.

Recently, another model was added to the Stout line. The new type is known as the "5-AT-1," and is quite similar to the earlier model, except that it is powered with three Pratt & Whitney "Wasp" engines and carries six-

teen persons; fourteen passengers, the pilot and a flight mechanic. In addition, there is a baggage compartment, a toilet and washroom Production on both models, which are on display this week at the aircraft show, is soon to be increased at the Dearborn plant of the Stout Metal Airplane Co.

Edsel B. Ford is president of the Stout company. With him, in charge of its operation, are W. B. Mayo, vice-president, and directing head; W. B. Stout, vice-president, and J. B. Craig, secretary.

Stinson Aircraft Corp.

Located at Northville, Mich., is the Stinson Aircraft Corp. which was organized June 15, 1926, by its present officers, Edward Stinson, president; Henry E Hand, vice-president; V. A. Mara, secretary, and Richard Fitz-Gerald, treasurer.

The first aeronautical activities of the firm began with the building of the first Stinson-Detroiters, although its president, Edward Stinson, has been active in aviation for more than 12 years.

The company is said to have built the first cabin plane with a starter, wheel brakes and cabin heaters. The dependability of Stinson built planes has been demonstrated by the flight of Brock and Schlee from Detroit to Tokio, Japan, in the "Pride of Detroit," and many other notable flights that are now aviation history.

The Stinson Aircraft Corp. has designed and built to date four different models, the SM-1B, the SM-1D, the SB-1 and the Stinson Junior SM-2.

Two models are on display at the Chicago Show, the SM-1D, which is the large cabin plane, and the Stinson Junior SM-2.

Stromberg Motor Devices Co.

A complete display of Stromberg Carburetors is on exhibition in the Stromberg booth at the Chicago Aircraft Show. The Stromberg Co. entered the automotive industry by supplying carburetors to the automobile manufacturers in 1907.

Stromberg carburetors have been standard equipment on many of the well known automobiles during the last 20 years. The firm entered the aero field in 1917 by supplying airplane carburetors to engine builders during the World War. This firm has developed a number of improved carburetors during the last few years and is now supplying many commercial manufacturers, and jobbers selling to the aeronautical industry.

The present are the original officers of the company: C. W. Stiger, president; W. L. O'Neill, vice-president, secretary-treasurer. The administrative offices are at 68 East 25th St., Chicago, Ill.

Summerill Tubing Co.

The Summerill Tubing Co. of Bridgeport, Pa., began the manufacture of seamless tubing at Philadelphia in 1899. T. M. Summerill, the active partner, was in charge of the business. The firm manufactures nickel silver, bronze, steel, aluminum, brass and copper tubing. In 1916, the firm began supplying special tubing to airplane and engine builders. In this year, it added a new unit to the factory to house the aircraft tubing department of the business. A second unit, an inspection department and a warehouse for stocking finished sizes of aircraft tubing, was added during the next few years. Early this year, another addition to the plant was made and now the concern is working both day and night shifts.

The management of the firm reports that, with the present equipment and personnel, the company is prepared to produce in 1929, 12,000,000 ft. of aircraft tubing.

Seamless steel, aluminum and copper tubing is being displayed at the Chicago Show.

The business of the Summerill Tubing Co. is directed by S. L. Gabel, president; N. H. Wofl, manager; E. V. Gabel, secretary-treasurer; W. H. Baker, superintendent; H. C. Knerr, metallurgist.

Supreme Propeller Co.

The Supreme Propeller Co. was originally organized as the Excelsior Propeller Co., in Washington, D. C., in 1910. In 1912 it moved to St. Louis, Mo. In 1917, upon the entrance of the United States into the World War the firm was reorganized as the Stone Propeller Co. and removed to Dayton, O. At that time the company, in conjunction with the U. S. Government Aviation Experimental Station, McCook Field, manufactured all the experimental propellers for the Army before the same were placed in production.

On June 15, of the present year, the company moved to Wichita, Kans., and was again reorganized under the name of Supreme Propeller Co. George H. Siedhoff is president; C. A. Noll, vice-president; A. B. Sanders, treasurer; M. J. Stone, secretary and general manager, and S. J. Stone is assistant secretary and general manager.

Several "Supreme" propellers of wooden construction, and of several different types and designs can be seen at the exhibit of this firm in the Coliseum, Chicago.

Swallow Airplane Co.

The present Swallow Airplane Co., of Wichita, Kansas, was taken over in 1927 by a number of local business men, and Victor Roos was placed in charge as general manager. The original company was organized in 1919 by E. M. Laird, who at that time began the manufacture of the Laird Swallow. The first Laird Swallow was put on the market in 1920. Since that time, more than 300 planes have been built by the company. With the assimilation of the company by its present officers, improvements were made on the plane and it became known as the "Swallow."

The Swallow is an open cockpit three-place biplane, a number of which are now being operated in practically every State in the Union. The factory was considerably enlarged in January, 1928, and to date the production has increased to 12 planes a week.

Two Swallow planes, one with a Wright Whirlwind engine, are being exhibited at the Swallow booth at the Chicago Show this week.

The management of the company is in the hands of W. M. Moore, president; J. W. Craig, vice-president, Victor H. Roos, secretary-treasurer and general manager. The factory is located on the company's airport about ten minutes from the business center of Wichita.

Szekely Aircraft Corp.

The Szekely Aircraft Corp., a division of the O. E. Szekely Corp., was re-incorporated under the State laws of Michigan on March 26, 1927, by O. E. Szekely, presi-

Left to right:—S. J. Stone, assistant secretary, Supreme Propeller Co.; S. L. Gabel, president, Summerill Tubing Co.; Victor H. Roos, secretary-treasurer, Swallow Airplane Co.

dent and general manager; Geo. W. Rundquist, secretary and treasurer, and E. O. Holmgren, vice-president. The original company, an Illinois corporation, began activities on June 14, 1920, in mechanical engineering and experimental work. In this field the company is best known as the creators and manufacturers of their Hydrostatic Draw Bar Dynamometer.

Since entering the aero field in 1927, the aircraft division has developed and built the SR-3 three-cylinder, radial, air-cooled aircraft engine, also the SR-5 aircraft engines of the same specifications. Experimental work is being done on the SR-7, a seven-cylinder engine of higher horsepower. During the last year, the Szekely Aircraft Corp. purchased the Niles Aircraft Corp. of Niles, Mich., and is now producing the "Flying Dutchman," a low-winged monoplane.

Two Szekely engines, the SR-3 and the SR-5, and a "Flying Dutchman" monoplane are displayed in the Szekely Aircraft Corp. space at the Chicago Show.

The company has now moved its offices and factory to Holland, Mich., and the present officers are O. E. Szekely, president and general manager, A. H. Wrieden, vice-president and Geo. W. Rundquist, secretary and treasurer.

Taylor Instrument Companies

Taylor Instrument Companies has been manufacturing weather forecasting instruments since the founding of the organization at Rochester, N. Y., in 1851. The company's interest in aeronautics was first shown in 1913 when it submitted an altimeter, as crude as the airplanes of that day, to the Army authorities at San Diego, California.

Instrument panels were at that time undeveloped and the altimeter was mounted on a strut near the pilot. So successful was its operation that Taylor Instruments Companies received the first order for altimeters ever placed by the Army.

The company went into forced production at the beginning of the War and in a short time Tycos altimeters were on practically all the training and combat planes made for the Army and Navy.

Aircraft and airport instruments manufactured by the firm include barometers, altimeters, altitude barometers, strut and dash thermometers, meteorgraphs, stormographs, stormoguides, thermographs, anemometers, sling psychrometers, hygrodeiks, compasses, altigraphs, balloon meteorgraphs, incidence gauges, and hygrographs. A full line of Tycos instruments are on display at space C-2 at the Chicago show.

The present Taylor Instrument Companies officials are Herbert J. Winn, president and treasurer; James Ely, vice-president and general manager, and H. W. Kimmel, secretary.

The Texas Co.

The Texas Co., well-known producer of gasoline and engine lubricating oils, which maintains its general offices at 17 Battery Place, New York, N. Y., has been supplying gasoline to the Army and Navy for many years. In the last few years, the company has taken an active interest in aviation, and now owns and operates a Ford three engined, all-metal monoplane. This plane is used for transporting the officials of the company about the country. At the aircraft show, the oil company is exhibiting its aviation products.

Texas Pacific Coal and Oil Co.

The Texas Pacific Coal and Oil Co. of Fort Worth, Tex., was founded in October, 1888, at Thurber, Tex. In November, 1927, this concern entered the aero field by supplying to operators "TP" aero engine lubricating oil and "TP" aero rocker arm lubricant. "TP" aero oil has been approved by leading aircraft engine manufacturers, such as Pratt & Whitney and Wright Aeronautical Corp., according to officials of the Texas Pacific Company, who say that this oil was used on the endurance flights in which a number of world's records were made by the Navy flyingboat PN-12.

Its complete line of aircraft lubricating oils is exhibited at the Chicago show by the company. This exhibit is in charge of B. T. Evans, manager of the St. Louis sales division office and other officials of the company.

The Texas Pacific Coal & Oil Co.'s present officers are Edgar J. Marston, president; E. R. Lederer, vice-president and in charge of refinery; O. E. Mitchell, vice-president; Larue Smith, vice-president, and R. Seibel, secretary-treasurer.

Tidewater Oil Sales Corp.

This company is now celebrating its 50th anniversary, but it has only been actively pushing the aeronautical end of its business since 1927. During this short time, however, the products of the company have won many laurels. Officials of the company cite the fact that Commander Byrd is using "Tydol" gasoline and "Veedol" oil on his South Pole explorations, and that the "Graf Zeppelin" used Tidewater products on its return flight to Germany. "Art" Goebel, Clarence Chamberlin and other well known pilots have also used Veedol and Tydol. The company owns a Bellanca plane which was flown by Emil Burgin at the Los Angeles races. There is a special department in the company dealing with aeronautical products and this is in charge of W. C. Gittinger.

The present officers of the company are Axtell J. Byles, president, and E. L. Shea, vice-president. At Chicago it has a particularly well arranged booth for the exhibit of its products and the entertainment of the many friends and users of the products.

Travel Air Manufacturing Co.

The Travel Air Manufacturing Co., one of the best known commercial aircraft builders, was organized at Wichita, Kansas, on Feb. 5, 1925. Beginning with the production at that time of a three-place, open cockpit biplane, powered with war surplus OX-5 engines, the company has increased its activities to the manufacture of two types (six-place and four-place) monoplanes and five types of biplanes powered with Whirlwind, Challenger, Warner Scarab, Hispano-Suiza and OX-5 engines. This firm is said to have the largest distributor organization, consisting of 109 distributers and dealers, throughout the country. It also has representatives in many foreign countries.

The Travel Air planes were winners of the 1925 and 1926 Ford Reliability tours. Another notable achievement of the Travel Air monoplane was the San Francisco to Honolulu flight which won the Dole prize for "Art" Goebel. The company has made steady progress in manufacture since the date of organization and is now producing from 18 to 20 planes per week.

Two planes are on exhibition at the Chicago Show, one of the new type biplanes and a six-place Travel Air monoplane.

An announcement has just been made that Hayden, Stone & Co. of New York has assumed a 50 per cent ownership in Travel Air, and word has been given out that a contract has been let for a new factory of approximately twice the capacity of the present Travel Air plant. The officers of the new company will be the same as at present: Walter C. Beech, president; Thad C. Carver, 1st vice-president; J. H. Turner, 2nd vice-president; W. R. Snook, secretary, and C. G. Yankey, treasurer. The firm expects to more than double its present production when the new factory is completed. It expects to buy the present Travel Air field as soon as the city of Wichita takes over its new 640-acre airport.

Timken Roller Bearing Co.

The Timken Roller Bearing Co. was organized at Canton, O., in 1898. It has been closely associated with the automobile industry since its inception and supplies bearings to practically all of the manufacturers. The company entered the aircraft industry several years ago when it began supplying landing wheel and tail wheel manufacturers with Timken tapered roller bearings. A number of aircraft wheel manufacturers have now standardized on Timken bearings. Timken bearings are also being used on crankshafts and rocker arms of aircraft engines. The Timken exhibit at the Chicago show consists of Timken bearings for wheels and engines. Timken Roller Bearing Co. is under the management of H. H. Timken, president; M. T. Lothrop, vice-president, and J. F. Strough, secretary and treasurer. General offices and plant are located at Canton, Ohio.

E. S. Twining & Co.

E. S. Twining & Co. was organized in New York City as a partnership between Edmund S. Twining and John H. Twining, in 1922. In 1924, the company entered the aero field by presenting to the industry "Flightex," an airplane fabric made from long strand Egyptian cotton. This is a close woven, mercerized product which gives a maximum strength. The firm also builds a side-product known as the "Airaft,"

Left to right:—Walter Beech, president, Travel Air Mfg. Co.; O. E. Szekely, president, Szekely Aircraft Corp.; Chance Vought, president, Chance Vought Corp.

similar to the one carried on Commander Byrd's plane, the "America."

E. S. Twining & Co. is exhibiting at the Chicago Show a roll of Flightex fabric, rolls of Pinked Edge Wing Tape of various sizes and a complete line of reinforcing tape. The exhibit also includes photographs of a number of new production planes covered with Flightex. Several other interesting features are shown including Airaft.

E. S. Twining & Co. operates from 320 Broadway, New York, under the management of Edmund S. Twining and John H. Twining, the original partners.

Vacuum Oil Co.

The Vacuum Oil Co., 61 Broadway, New York, N. Y., was organized Oct. 4, 1866, with offices at Rochester, N. Y. Hiram Bond Everest was the first president.

Records of the company show that Mobiloil was supplied to the Wright brothers, Curtis, and Hamilton as early as 1909. It is the boast of the firm that Mobiloil was used for engine lubrication by many prominent pilots when they set out to make aeronautical history.

The main exhibit of the Vacuum Oil Co. is a large map of the world with the outstanding historical flights, between countries or cities in America and Europe, where Mobiloil was used, shown in colored lines. The flights include the New York to Paris flight made by Col. Charles Lindbergh, as well as his tour of the United States and Central America; Comdr. Richard Byrd's first flight to the North Pole; Miss Amelia Earhart's trans-Atlantic flight; the around-the-world flight by the U. S. Army fliers; the flight of Captain Wilkins to the Polar regions; "Art" Goebel's flight from San Francisco to Honolulu, and Lieutenant Maughan's dawn-to-dusk flight across the United States. In addition, the company is showing a continuous moving picture of Colonel Lindbergh's flight from San Diego to New York and Paris, Miss Earhart's flight and Commander Byrd's dash to the North Pole.

The firm is now located at 343 S. Dearborn St., Chicago, Ill., and the present officers of the company are Edward Prizer, chairman of the board; G. P. Whaley, president of the board; C. E. Bedford, C. E. Arnott, and W. M. McGee, vice-presidents of the board; Herbert Baker, vice-president and treasurer, and G V. Holton, secretary.

Chance Vought Corp.

Chance Vought Corp., well-known airplane manufacturer with headquarters at Borden and Review Aves., Long Island City, N. Y., was organized in 1917 and is the successor to the earlier Lewis and Vought Corp. The first model produced by Chance Vought Corp. was the VE-7. This was introduced in 1918 and was used extensively by both the Army and Navy. The UO series were the next planes produced by the company, and were adopted by the Navy for observation and kindred work, which included catapulating from battleships and cruisers and landing and taking-off from aircraft carriers. The latest Vought model is the "Corsair." This was particularly well received and is now in use in both the military and commercial fields.

The planes manufactured by Chance Vought Corp. have all been built to the designs of Chance M. Vought, who is the assistant treasurer and chief engineer of the organization. Mr. Vought first learned to fly in 1910 and since that time has devoted his entire energies to aviation. Before actively entering the industry as a manufacturer, he designed and built a number of successful planes. His experience in flying and designing is reflected in all of the models that the company has produced and is responsible to a great extent for the success with which these planes have attained.

The Corsair landplane and the interchangeable water gear is on exhibit at the display of the Vought company this week at the Coliseum. This plane has also been developed as an amphibian.

The present officers of the company, aside from Chance Vought are George W. Vought, president; Robert B. Knowles, vice-president, and Ena Lewis Vought, secretary-treasurer.

Velie Motors Corp.

The Velie Motors Corp., Moline, Ill., was organized in November, 1916, to manufacture automobiles. W. L. Velie was president, F. E. Bradfield, vice-president, and O. E. Mansure, secretary and treasurer.

This firm entered the aeronautical field in February, 1928, when it began the production of engines for aircraft. At present the company is producing two engines, one a five cylinder, 45 hp., and the other a nine cylinder engine, said to develop 180 hp. Both engines are radial air cooled types. Two engines manufactured by the Velie Motors Corp. are on display at Chicago.

W. L. Velie, Jr., is now vice-president of the concern and A. T. Huesing is secretary and treasurer.

Van Schaack Bros. Chemical Works, Inc.

Van Schaack Bros. Chemical Works, Inc., Chicago, Ill., was organized in 1914 by R. H. Van Schaack, Jr., president; R. H. Van Schaack, Sr., vice-president and L. L. Van Schaack, secretary and treasurer. Since its founding, this concern has manufactured and has furnished the aero industry with nitrate dope. As the demand on the part of the industry increased this company created a line of airplane lacquer finishes which it is now producing in addition to nitrate dope. The full line of Van Schaack products is attractively displayed at the Chicago Aircraft Show.

The original officers are still at the head of the concern which is located at 3358 Avondale Ave., Chicago, Ill.

Westinghouse Electric & Manufacturing Co.

The Westinghouse Electric & Manufacturing Co., manufacturer of electric equipment and allied products, was organized in 1886 by George Westinghouse, its first president. This company entered the aero field in 1917 by supplying electrical equipment to aircraft manufacturers and airports during the World War. Progressing in the aeronautical department to the present date, it is now manufacturing complete airport lighting equipment, airway beacons, radio beacons, Micarta propellers, pulleys, fair leads, sheeting and instruments. The worth of the new product, the Micarta propellers, was proved by their use as equipment on the "Southern Cross" on its flight from California to Australia. Westinghouse airport lighting equipment is now installed in many airports throughout the United States including some of the most important.

Complete airport lighting equipment, Micarta propellers, pulleys, fair leads, sheeting and light and power plants are at the Westinghouse space at the Chicago Show.

The Westinghouse Electric Co. is under the management of E. M. Herr, president; F. A. Merrick, vice-president and general manager; and the following vice-presidents: Walter Gary, H. P. Davis, H. T. Herr, E. D. Kilburn, L. A. Osborne, W. S. Rugg, H. D. Shute, C. A. Terry, and J. C. Bennett. General offices and factory are located at East Pittsburgh, Pa.

The Vellumoid Company

"Vellumoid" packing and gaskets have long enjoyed a large distribution in the automotive industry. The original products of the company were "Vellumoid" sheet packings and gaskets, which have been in use by automobile manufacturers since almost the beginning of automobile building.

"Vellumoid" is a sheet packing made especially for the oil, gasoline and water connections, and was first introduced into the aero field when it was supplied to the pioneer plane builders.

The Vellumoid Co. is displaying all of its products at the Chicago Aircraft Show.

Wright Aeronautical Corp.

The origin of the Wright Aeronautical Corp. dates back to 1909 and the original Wright Company, which was organized by the Wright Bros. and a group of New York capitalists in order to develop the Wright airplane. Owing to the small demand for aircraft, it was impossible for this company to progress much until the World War. Prior to the outbreak of the War, the Wright Bros. had ceased to have any personal interest in the Wright Company or its management and its control passed into the hands of bankers. Before the entry of the United States into the War, the management of the Wright Company acquired control of the Simplex Automobile Co. of New Brunswick, N. J. With this merger completed, arrangements were entered into with the Hispano-Suiza Co. in France, under which the American rights to the manufacture of the Hispano-Suiza aircraft engine were secured and a quantity of these engines were produced for the French Governmnt.

In order to finance the proposed operations and equip the plant with sufficient machinery, the Wright-Martin Aircraft Co. was organized in 1916 and merged with the Wright Company.

From 1917-1919, the Wright-Martin Aircraft Co. turned out approximately 10,000 Hispano type engines of 180 and 300 hp. for the U. S. Government. At the end of the War, the plant at New Brunswick was sold to a motor truck manufacturer and approximately 75 per cent of the Wright-Martin Company's capital was distributed to its stockholders as a partial liquidating dividend.

The Wright Aeronautical Corp. was then organized and moved to its present location in Paterson, N. J. The present plant including buildings to be completed by the end of 1929, has over 1,000,000 sq. ft. of floor space. In 1925, through a merger with the Lawrence Aerial Engine Corp. the company acquired all rights of the Lawrence air-cooled engine.

The Wright Whirlwind engines were used on all of the successful trans-oceanic flights of the last two years, as well as on other notable air ventures. Among the many famous pilots who used Wright Whirlwind engines are: Lindbergh, Chamberlin, Maitland and Hegenberger, Byrd, Brock and Schlee, Smith, Goebel, Stultz, Haldeman, and Kingsford-Smith.

The company has on display at the Chicago show all of the new Wright aero engines including the 525 hp. "Cyclone" and the following J-6 series: 150 hp. five cylinder model, the 225 hp. seven cylinder model, and the 300 hp. nine cylinder model.

The present officers of the company are Charles L. Lawrence, president; Richard Hoyt, chairman of the board of directors; Guy Vaughhan, vice-president, and James F. Prince, secretary and treasurer.

Warner Aircraft Corp.

Warner Aircraft Corp., producer of the Warner "Scarab" engines, was organized in October, 1926, with headquarters at 2512 E. Grand Blvd., Detroit, Mich. Airplanes powered with Warner Scarab radial engines

Left to right:—N. B. Lambert, Westinghouse Electric Mfg. Co.; Charles Arens, Wilson Steel Products Co.; Charles L. Lawrance, president, Wright Aeronautical Corp.

won first, second, third and fourth places in class A of the 1928 National Air Derbies, New York to Los Angeles A 110 hp. Scarab engine is being exhibited by the manufacturers at the Chicago show.

The offices of the firm are now located at 4042 Jefferson Ave., Detroit, Mich. The executives are Newton Skillman, president; William O. Warner, vice-president; Edward N. Hartwick, treasurer, and Wiliam J. Jarvis, secretary.

Wilson Steel Products Co.

The Wilson Steel Products Co. was organized in 1903 for the manufacture of nails, wire, rivets and tacks. It entered the aeronautical industry a short time ago when Charles Arens, designer of the Arens control joined the organization, giving the firm the manufacturing and sales rights on his products. A factory of approximately 10,000 sq. ft. has been built for the manufacture of these controls and production on a quantity basis has already begun. The Arens controls are being exhibited by the Wilson Steel Products Co. in its booth at the Chicago Show.

The firm, at present located at 4840 S. Western Ave., Chicago, Ill., is headed by John Grassell, president; M. W. Van Arsdale, vice-president, and Phillip W. Grassell, secretary and treasurer.

Wyman-Gordon Co.

The Wyman-Gordon Co. has been manufacturing forgings since 1883, when the company was originated as a partnership by L. F. Gordon and H. W. Wyman. This firm supplied forgings to the automobile industry from its beginning. In 1912, it entered the aero field and during the World War, manufactured thousands of crankshaft forgings for the United States, England, France and Italy. Since the War, it has been supplying many of the leading American aircraft engine builders with crankshaft and other vital forgings. The company is exhibiting crankshafts and other forgings at Booth Y-3, at the Chicago Show.

The management of the company is G. F. Fuller, president; H. G. Stoddard, vice-president and general manager; and F. A. Ingalls, vice-president. The company's plant and administrative offices are located at Worcester, Mass., with sales offices in Detroit, Michigan and Paris, France. It also operates the Ingalls-Shepard Division at Harvey, Ill.

The following firms are also exhibiting at the Chicago show:

Name.	Exhibit.
Aero Model Co. Chicago, Ill.	Motor emblems
Aerovane Utilities Corp. New York, N. Y.	
Aircraft Engine Corp. Oakland, Calif.	Engine
Alliance Aircraft Co. Alliance, O.	Plane
Beldon Manufacturing Co. Chicago, Ill.	Iusulation and Parts
Binks Spray Equipment Co. Chicago, Ill.	Paint
W. P. Blinkerhoff New York, N. Y.	
Sidney Blumenthal and Co. New York, N. Y.	Mohair Fabrics
Cities Service Oil Chicago, Ill.	Oil
Dayton Airplane Engine Co. Dayton, O.	Engine
Eclipse Machine Co. East Orange, N. J.	Starters
Firestone Tire and Rubber Co. Akron, O.	Tires
Fleischmann Transportation Co. New York, N. Y.	Balsa Wood
W. H. Gardner and Sons. Forest Park, Ill.	Propellers
Hamilton Aeronautical Manufacturing Co. Milwaukee, Wis.	
Harwein Products	
Heath Airplane Co. Chicago, Ill.	Plane
Kinner Airplane Motor Co. Glendale, Calif.	Engine
National Steel Products Co. Dayton, O.	Parts
New Departure Manufacturing Co. Bristol, Conn.	Ball-bearings
Marvin A. Northrop Minneapolis, Minn.	Engine
Ohio Seamless Tube Co. Shelby, O,	Seamless tubing
Parker and Company. Philadelphia, Pa.	Insurance
Phantom Knight Aircraft Co. Oak Park, Ill.	Plane
Pyle-National Co. Chicago, Ill.	Lights
H. H. Robertson Co. Pittsburgh, Pa.	Model hangar
Rome Wire Co. Rome, N. Y.	Electrical Wires
S & H Model Airplanes St. Petersburg	Models
Standard Automatic Products Co. Corry, Pa.	
Stinson School of Aviation Detroit, Mich.	Airplane
Strauss and Buegeleisen Brooklyn, N. Y.	Goggles
Toro Manufacturing Co. Minneapolis, Minn.	Equipment
Union Oil Co. Los Angeles, Calif.	Oil
Westinghouse Lamp Co. Bloomfield, N. Y.	Lamps
Wood Conversion Co. Chicago, Ill.	Balsam

Aero Conference Delegates Announced by 30 Countries

Official and Unofficial Representatives Arriving to Consider Civil Air Problems

WASHINGTON, D. C.—Executive offices of the International Civil Aviation Conference announce, as we go to press, that names of official and unofficial delegates of 30 foreign countries have been received. The conference, called for the twenty-fifth aniversary of power-driven flight, takes place at Washington, December 12-14. Some of the delegates are now in this country and others are reported on their way. Several nations have selected only part of their delegations. Others have indicated their intentions of participating but have not yet forwarded their selections. Further names of official and unofficial delegates will be announced as received.

Following are the official and unofficial delegates whose names have been received to date:

Austria — Official: Eugen Hauenschield, Counselor of Legation, Washington. Unofficial: Hofrat Deutelmoser, engineer, Austrian Air Transport Co.

Australia—Official: Lieut. Col. H. C. Brinsmead, Q.B.E., M.C., Controller General of Aviation; Capt. G. F. Hughes, president, New South Wales Section, Australian Aero Club.

Belgium—Official: Emile Allard, chief engineer and director of Technical Service, Aviation Dept. Unofficial: Baron G. de Bethune, Royal Belgian Aero Club.

Canada Sends Eight

Canada—Official: G. J. Desbarats, Deputy Minister of National Defense; P. T. Collican, Assistant Deputy Postmaster General; Wing Commander J. L. Gordon, D. F. C., director of Civil Government Air Operations. Unofficial: J. A. Wilson, Controller of Civil Aviation; T. T. Bower, Postmaster, Winnipeg; J. O. Apps, general executive assistant, Canadian Pacific Railway; A. E. Low, president, Canadian Colonial Airways; W. T. Reid, Reid Aircraft Co.

Chile—Official: Capt. Marcia L. Arredondo, Chilean Army aviator now at Selfridge Field, Mich.; Alfredo Leigh, Chilean engineer and aircraft inventor now in New York City.

China—Official: Wang Cheng Fu, of Shanghai, an engineer residing in France.

Costa Rica—Official: Manuel Castro Quesada, Minister to Washington.

Cuba Represented

Cuba—Official: Capt. Eduardo Laborde, Cuban Army; Ensign Arnot de Plazaola, Cuban Navy.

Czechoslovakia—Official: Dr. Jan. Papanek, Secretary of Legation, Washington.

Denmark—Official: Peter Olaf de Treschow, First Secretary of Legation, Washington.

Finland—Official: L. Astrom, Minister to Washington.

France—Official: Pierre Etienne Flandin, vice president of the Chamber of Deputies; M. Sabatier, Engineer General of Aeronautics in the Air Ministry. Unofficial: D. O. Baudouy, Baudouy & Co., New York City, agent in United States for Campagnie Generale Aeropostale, Paris.

Germany—Official: Geheimer Ragierungsrat Fisch, Reich Ministry of Transportation; Dr. Emil L. Baer, Secretary of Embassy, Washington. Unofficial: Otto Merkel, director of Deutsche Lufthansa; Dr. A. K. Rohrbach, Rohrbach Metal Airplane Co.; W. Hormel, Heimkelflug Zengwerke.

Great Britain—Official: Brig. Gen. The Right Honorable Lord Thomson, C. B. E., D. S. O., formerly Secretary of State for Air; Capt. R. J. Goodman Crouch, O. B. E., Supply and Research Dept. of the Air Ministry.

Guatemala—Official: Dr. Don Ramiro Fernandez, Secretary of Legation, Washington; Aviator Commander Oscar Morales Lopez, Guatemalan Army.

Hungary—Official: Count Laszlo Szechenyi, Minister to Washington.

Irish Free State—Official: William J. B. Macaulay, First Secretary of Legation, Washington.

Italy—Official: General Italo. Balbo, Undersecretary of State for Aeronautics; Count Alberto Marchetti di Muriaglio, Counselor of Embassy, Washington; Col. Todoschini Lalli, Maj. Bitossi and Lieut. Cagna, all of Royal Air Force. (Other superior officers of Air Service and about 10 representatives of Italian air lines and aircraft manufacturers, whose names will be communicated later.)

India—Unofficial: S. R. Romanji, Indian Merchants Chamber of Bombay, now in New York.

Mexico—Guillermo Villasona, chief of the Division of Aeronautics of the Department of Communications.

Netherlands—Unofficial: Jonkheer Van Denber Van Heemstede, General Manager of the International Air Traffic Ass'n.

New Zealand—Unofficial: R. H. Dix, representing Marlborough; M. H. Barlow, representing Canterbury.

Norway—Official: A. Lundh, Counselor of Legation, Washington.

Panama—Official: Ricardo Alfaro, Minister to Washington; Ramon Arias, Panaman West Point graduate and aviator, now in Washington; Eduardo Icaza, Civil Engineer, Panama City; Guillermo Single, Panaman aviator now in Washington; William Y. Boyd, American resident in Panama and wartime aviator.

Persia—Official: Mozaffar Mirza Firouz, Second Secretary of Legation, Washington; Dr. Marcellus D. Redlich, acting Imperial Persian Consul in Chicago.

Poland—Official: Julian Eberhardt, former Vice Minister of Communications; Witold Wankowicz, Commercial Counselor, Polish Legation, Washington.

Spanish Delegates Named

Spain—Official: Don Juan J. Jauregui y Gil Delgado, Chief of the Section of Aero Traffic; Maj. Victoriano Casajus, Military Attache, Spanish Embassy, Washington; Maj. Joaquim Perez Seoane, Chief of Section of Airports.

Sweden—Official: Nils Gustaf Wiedel, Commercial Counselor of Legation, Washington; Capt. Carl Fredrik Florman, Managing Director of Aero Transport Co., Ltd. Unofficial: Karl Lignell, chief engineer and traffic manager, Aerotransport.

Switzerland—Official: Etienne Lardy, Counselor of Legation, Washington.

Venezuela—Official: Luis Churion, Secretary of Legation, Washington, D. C.

Showing American delegates in a special meeting previous to the International air conference to be held in Washington, December 12-14. *Left to right, sitting, Nelson T. Johnson, H. P. Warner, William F. Whiting, chairman, William P. MacCracken, Jr., and Harry F. Guggenheim. Standing, Lester D. Gardner, Joseph S. Amos, and W. Irving Glover.*

Fairchild Tests New Silencer for Engines

FARMINGDALE, L. I.—Development of an effective silencer for airplane engines has been completed after two years of experimentation according to an announcement made recently by Sherman M. Fairchild, president of the Fairchild Aviation Corp. The device consists of a metal tube 4 in. in diameter and 6 ft. long connected to the exhaust manifold and running under the fuselage. Within the pipe is a metal spiral of special design, which is said to reduce the exhaust report to a hissing sound.

The new silencer was developed by Harry Ahrens, Fairchild engineer, in collaboration with the Maxim Silencer Co. and has undergone a number of tests on an air cooled radial engine installed in a Fairchild cabin monoplane. It is said that manometer tests indicated that no back pressure was built up in the device.

According to Mr. Fairchild, engineers of the corporation are now at work on the problem of silencing propeller and rocker arm nosies and expect a solution within the next year.

Air Service Offered To Chicago for Show

CHICAGO, ILL.—Aerial excursions from Cincinnati and Indianapolis to the International Aircraft Show at Chicago, December 1-9, will be run each day of the show by the Embry-Riddle Company of Cincinnati, O.

Cabin planes, Fairchilds and Ryans, will be used in this service, and the schedule will provide a departure each way each day in addition to the regular mail service, which will also carry passengers. The excursion planes will leave Cincinnati at 9:30 daily, and returning leave Chicago at 1:30, Chicago time. The mail planes leave Cincinnati at 3:45 P. M., and returning, leave Chicago early in the morning.

Dunn Completing Monoplane

CLARINDA, IA.—The Dunn Manufacturing Co. will shortly complete an experimental monoplane with capacity for pilot and three passengers and now plans to establish standard production here next year with an initial 1929 schedule of one plane a week. Harold L. White, Chicago, whose father, Burt S. White, Des Moines, operates the White Aircraft Co., is assisting in perfecting the new plane, which will be equipped with Kinner engine. The plane, it is said, will have a cruising speed of 90 m.h.p.

Consolidated Plans Merger

NEW YORK, N. Y.—Information has been received by the industry that the Consolidated Instrument Co. of America, this city, is completing negotiations for the acquisition of one of the oldest and largest meterological and airport instrument manufacturing concerns.

Records Made By Stearmans

SALT LAKE CITY, UTAH—New records have been hung up by Stearman planes newly placed in mail service by the Varney lines, operating between this city, Boise, Ida., and Pasco, Wash. The Boise-Pasco run of 240 air miles has been made in 1 hr. 30 min., while the Salt Lake-Boise section has been flown in 1 hr. 55 min. Air miles of the latter run are 275.

American Eagle Basis Of Project by Durant

KANSAS CITY, MO.—It is reported that a new organization is to be built around the American Eagle Aircraft Corp. by Clifford Durant, son of William C. Durant of Durant Motors, Detroit. Carrying a substantial stock interest and joined in the project by several other Detroit men, Clifford Durant plans the establishment of an aviation concern which, it is said, will turn out planes following modern automobile production line methods.

According to the reports, at least three other companies will be acquired in the formation of the new firm. A subsidiary, to be organized for nation-wide distribution of planes, will be composed of veteran automobile men familiar with national sales methods. Barney Oldfield, recently named a vice-president of the American Eagle Aircraft Corp., will be included in this group. It is announced that many agency contracts have already been signed.

Woolaroc Remodeled For Record Attempts

WICHITA, KAN.—Art Goebel has had his Travel Air monoplane Woolaroc, in which he won the Dole flight to Hawaii, remodeled at the Travel Air factory here. The plane, carrying Wasp power, is to be used by Goebel in new transcontinental record flight attempts and for a proposed flight from Wichita to South America.

The pilot's seat and all controls of the Woolaroc have been taken from position directly behind the engine and placed well back of the middle of the fuselage assembly, the space in front being given over to tanks for 600 gal. of gasoline.

Burgess Muffler Tested

MINNEAPOLIS, MINN.—Tests are now being conducted here by Universal Air Lines on a new type of engine muffler developed by the Burgess Laboratories, Madison, Wis., and installed on a Ryan Brougham at Wold-Chamberlain Airport. If the muffler proves successful it will form the basis for similar equipment to be installed on all planes of the company.

Citizens Acquire Duster Company

Huff Daland Concern Is Taken Over by Delta Air Service, Inc.

MONROE, LA.—To prevent the proposed removal of the Huff Daland Dusters company from Louisiana, leading citizens of Monroe, headed by Travis Oliver, banker, recently formed a corporation and bought the company.

The Keystone Aircraft Corp. of Bristol, Pa., former owner of the Huff Daland company, operate aeronautic companies extensively in several Southern states, as well as in Mexico and South America. However, directors of this organization had decided to remove the Huff Daland company from Louisiana.

Monroe citizens have formed the Delta Air Service, Inc., buying the duster concern. The assets include two airplanes, eight automobiles, and other equipment, placed at the Selma Field, Monroe, which will also be used by the new company.

To Offer Other Services

Lieut. H. R. Harris, now traveling in South America, Travis Oliver, and C. E. Wolman, local entomologist, with several other local cotton planters will direct the Delta company. Officials said that the organization would do dusting work around Monroe, operate passenger lines, carry on photography and map work, and open a school of aviation.

Show Program

The program of meetings at the International Aeronautical Exposition, Chicago, December 1-9, as announced recently by the Aeronautical Chamber of Commerce, follows in condensed form for handy reference. This program extends from Sunday, December 2, through Friday, December 7..

Sunday—Flying School Committee convenes. In evening informal dinner for trade paper and newspaper correspondents.

Monday — Publisher-members of Chamber meet at breakfast to organize section. General meeting.

Tuesday—All-day session by Commercial Airplane Manufacturers' Section.

Wednesday and *Thursday*—Joint sessions of Chamber and Society of Automotive Engineers. Special meeting of S.A.E. and Aircraft Manufacturers' Section Thursday afternoon.

Friday—Entire day devoted to National Airports Conference. Foreign delegates arrive in afternoon, and are guests at public banquet in evening.

Plan to Use J 6 In "Sport Waco"

Latest Model is Single Bay Biplane with Tapered Wings

TROY, O.—In response to the demand for a high performance airplane for sport and high speed commercial work, the Advance Aircraft Co. here has developed a tapered wing biplane known as the "Sport Waco." The first planes of this type were built in May of this year but owing to the demand for the other models, production was not actually started until July. The Whirlwind powered Sport Waco flown by John Livingston took two prizes in the 1928 Transcontinental air derbies. It is planned to use the new Whirlwind J-6 engine as soon as it is available.

The Waco Sport is a single bay biplane designed for use with engines up to 400 hp. Production models are now powered with either a Hispano 180 hp. or Wright Whirlwind engine. The high speed of the J-5 model is 140 m.p.h.

M-6 Airfoil Section Used

A tapered M-6 airfoil section is used in the wings which are characterized by substantial spar and rib construction. Fittings and external bracing also are designed to withstand heavy loads. The plane has a wing span of 30 ft. 3 ins. and length of 22 ft. 6 in. The center section is very wide and extends beyond the struts to a point where the spar bending moment is zero. The thick wing section permits use of comparatively large center section tanks.

Both upper and lower surfaces of the leading edge are reinforced with duralumin, the trailing edge being of copper coated steel, Flightex fabric being used for covering, which is doped, sanded and finished to a smooth surface. Four narrow chord ailerons are operated by the Waco system of tubular push rods and bell cranks.

Has Typical Waco Fuselage

The fuselage is characteristic Waco welded steel tube construction without wire bracing of any kind, this being made up as a unit including the engine mount. The entire fuselage structure is sand blasted before prime coating, all openings being sealed by welding to prevent internal corrosion. The turtle deck is of spruce and mahogany plywood; spruce fairing members being used on the sides and bottom of fuselage. Sheet aluminum cowling extends to the rear of the pilot's cockpit, and a streamlined headrest is provided.

Two types of landing gear can be furnished for the Sport Waco. The speed model landing gear is the type used on the Waco Nine, lugs for which are provided on all Waco airplanes. The standard oleo type split axle landing gear also can be used with either 26 by 4 in. or 30 by 5 in. wheels, with or without Bendix Brakes. A leaf spring tail skid with manganese steel tail skid shoe is used.

A 68 gallon main tank in the fuselage is standard equipment. This can be supplemented by two center section tanks giving 35 gallons additional capacity. If the fuselage space is desired for cargo, a 65 gallon gasoline capacity can be arranged by the use of lower wing tanks in addition to the center section tanks.

Ample space for luggage is provided in the luggage compartment to the rear of the pilot's cockpit and dual control is standard equipment.

A flight picture of the "Sport Waco," showing the Whirlwind J-5 engine cowling and the optional model 9 undercarriage.

To Manager A.T.E. Sales

GARDEN CITY, N. Y.—Air Transport Equipment, Inc., supply and equipment distributor with headquarters at Hangar 20-A, Curtiss Field, announces the appointment of R. R. Rennee as general sales manager. Mr. Rennee, associated with aviation since the early part of the War, will cover the entire Eastern territory of the United States, visiting airports and calling on the trade.

Taking Detroit Show Entries

DETROIT, MICH.—Entry blanks for the second All-American Aircraft Show, to be held at Convention Hall, this city, April 6-14, 1929, are being distributed by Ray Cooper, secretary of the Aircraft Bureau of the Board of Commerce, who will again manage the exposition.

R. O. Bone Co. Address

An advertisement in the November 17 issue of AVIATION gave the address of the R. O. Bone Co. incorrectly. The firm, maker of the Golden Eagle Monoplane, is located at 415 East Industrial Avenue, Inglewood, Calif.

Airplane Being Built By Gordon & Stryker

LOS MOLINOS, CAL.—Construction is well advanced on a two place monoplane of novel design being built here by Gordon & Stryker. The plane is to be test flown about January 1, if present plans are carried out.

This craft is of metal construction throughout, except that wings and fuselage are fabric covered. The fuselage is welded steel tubing. The wing spars are bolted up from steel tubing and the ribs are welded steel tubing. The bolting in the spars is such that all bolts are in double shear. Eventually it is expected the ribs will be stamped from duralumin but in this initial plane welded ribs will be used.

The wing is given an unusual placing, approximately in the plane of the upper longerons of the open model and about midway between upper and lower longerons of the cabin model.

The design is by Frank Gordon, formerly of the 29th Aero Squadron, who is said to have devoted three years to designs and tests of the new plane. Robert F. Stryker is associated with Gordon.

Boll Joins Goodyear

AKRON, O.—U. H. Boll, formerly associated with the civilian organization at McCook Field, Dayton, O., during and following the war period, is now a member of the airplane tire and accessories sales division of the Goodyear Tire & Rubber Co., Akron, O., it is announced.

At the outbreak of the war, Mr. Boll was affiliated with Dayton Wright Airplane Co. as specification engineer, later going to the purchasing department of the same organization. He was then selected as a statistician with the Government at McCook Field.

Cincinnati Arranging For Dual Celebration

CINCINNATI, O.—The coincidence of the anniversaries of human flight and the first air mail service for Cincinnati will be made the occasion for a celebration here throughout the week of December 17.

Honoring the Wright Brothers and celebrating its own improved mail service, Cincinnati will hold open house at Lunken Airport, the municipal field. Guides and experienced employes of the Embry-Riddle Company will be available to conduct visitors through the hangars and shops, and explain the plans of the city for development of the airport.

An exhibition of model planes built by Cincinnati boys, photographs depicting the history of airplane development, wartime airplane types, and samples of aerial photography will be held in the offices of the company. A second exhibit will consist of the work of airplane and engine factories of the city.

Exhibition flying, student instruction, and the arrival and departure of the mail planes will be open to the public.

Mendez Flying Falcon To Colombian Capital

NEW YORK, N. Y.—Lieut. Benjamin Mendez has arrived at Havana, Cuba, completing the second leg of his trip from New York to his native capital, Bogota, Colombia, and, as we go to press, is preparing his Curtiss Falcon seaplane "Recaurte" for the next hop to Puerto Barrios, Guatemala.

The 1,040 mi. flight between Rockaway Beach and Jacksonville, Fla., and the 600 mi. trip from Jacksonville to Havana were made without incident. The fliers averaged slightly better than 110 m.p.h. on the second leg.

From Havana the proposed itinerary will take Mendez to Porto Barrios, thence to Colon, Panama, and then to his destination, Colombia.

Rush Work on Knoll Plane

WICHITA, KAN.—The Knoll aircraft factory, where Wichita's newest airplane is under construction, presents the appearance of a beehive. Workmen are busy night and day on the first of the new type plane, which is expected to be ready for tests by the middle of December. Six men are employed on the engineering staff and 18 men on the staff of mechanics.

Contracts With Travel Air

INDIANAPOLIS, IND.—Hoosier Airport, owned by Bob Shank and Harold Brooks, has entered into a new contract with the Travel Air Manufacturing Co., of Wichita, Kan., to distribute Travel Air planes in Indiana and Ohio during 1929. Working in a larger territory, Shank and Brooks have sold 26 planes thus far this year.

St. Louis Gets Balloon Event

ST. LOUIS, MO.—This city will be host to the competitors in the international balloon race for the Gordon Bennett trophy next year, it is announced following the decision of the St. Louis Air Board to raise $15,000 to help finance the project. This will be the first time since 1904 that the international contest has started from St. Louis.

A force of 300 soldiers from the lighter-than-air base at Scott Field to handle the balloons has been offered by Lieut. Col. John A. Paegelow, commandant.

Service to Montreal Brings $3,000 Profit

WASHINGTON, D. C.—Report for the first month of operation of the Canadian Colonial Airways over the route Montreal-New York, via Albany, shows a net profit of $3,000, all costs, depreciation, and insurance charges being covered, according to the Department of Commerce.

Gross receipts totaled $17,000, Assistant Trade Commissioner L. A. France, Montreal, advises the Department. Some 21,900 mi. were flown and 35 passengers were carried, together with 10,885 lb. of mail that represented about 34,200 pieces.

Service is daily except Sundays. Passengers are carried for brief rides on Sunday and revenue from this business is reported a considerable factor in the profitable operation for the first month.

Trying for Duration Record

FRESNO, CALIF.—As we go to press, Lee Schoenhair and John Guglielmetti are still aloft in the Whirlwind J-5 powered monoplane Albatross B-1 in which they are attempting to break the world endurance record of 65 hr. 25 min. held by the German fliers, Risticz and Zimmerman. The plane was taken off tre field for the duration flight at 6:41 A. M., November 25.

The Albatross carried 646 gal. of gasoline and 40 gal. of oil, it is reported, the gross weight of the plane being put at more than 7,000 lb. The craft was designed by Charles Rocheville of the American Albatros Co., Long Beach, now in production of the plane.

Test Stearman Coach Soon

WICHITA, KAN—The Stearman Aircraft Co.'s first enclosed plane, to be known as the "Stearman Coach," will be given a test flight late in December. Shipment on the engine, a 300 hp. Wright J-6, has been promised for December 15. The Stearman company had hoped to exhibit the new plane at the International Aeronautical Show at Chicago the first week in December.

Expansion of Greer College is Reported

CHICAGO, ILL.—The aviation division of Greer College of Engineering, Chicago, is rapidly expanding training facilities to accommodate a fast growing enrollment. The most recent development is the acquisition of a new flying field located at Elmhurst, Ill. This new field already has runways which fit it for all-year flying except under most severe weather conditions. Two 100 ft. hangars will be erected shortly. Greer Airport has an advantage of location quite near to the city.

Flying equipment to be moved to the new field as soon as hangars are completed includes: an Eaglerock, a Sport Waco, a Whitey sport monoplane, and a Viking 4 place cabin plane. Equipment and training will be in charge of Chief Pilot Meyer, well known in Chicago flying circles as head of Meyer Air Transport.

Greer College recently acquired the equipment of the Chicago Aviation Co. and the Viking Aircraft Co. All of the school equipment belonging to the Chicago Aviation Co. has been moved to the Greer College building.

Deliver First of Wasp Ford Planes to T. A. T.

DETROIT, MICH.—The first of 10 high-powered tri-engined Ford planes, a three Wasp craft ordered by Transcontinental Air Transport, Inc., has been delivered to Col. Paul Henderson, vice president of the company.

The plane has been assigned to Colonel Henderson to be used as his "flying office." Its interior is handsomely fitted, furnishings including two desks, a sleeping bunk, and 10 chairs. One of the desks will be used by Colonel Henderson and one by H. B. Osborne, his secretary. Shortly following delivery of the craft in Washington, the vice president and several officers of the Transcontinental Air Transport, Inc., were to take off on an inspection tour of the combination air and rail lines proposed to be operated by the corporation.

Introduces Airport Lamps

CLEVELAND, O.—National Lamp Works of this city announces a new line of Mazda lamps designed with particular reference to the needs in lighting airports. Included in the series are lamps of various strength for use in floodlights, either with reflector or lense equipment, one type made for use in advertising beacons, and one for standard airway beacons.

Test Levelometer at Oakland

OAKLAND, CALIF.—A new instrument, known as the "Levelometer," which is said to instantly indicate banking, pitching, climbing, or rolling movements in airplanes, is being tested at Oakland Muncipal Airport by Maj. Livingston Irving. The new instrument is a product of the Tri-Arc Company of Oakland.

Kinner Planning Quadruple Output

Company Prepares to Produce 200 Engines Monthly at Glendale

GLENDALE, CALIF.—Following a recent trip through the East, W. B. Kinner, president of the Kinner Airplane and Motor Corp. of Glendale, has announced that his company is preparing for the production of 200 engines per month instead of 50 as had originally been planned. He stated that with equipment now being installed the Kinner plant should be turning out 50 engines per month by January 1 and 200 per month by April 1.

Mr. Kinner will be in charge of the Kinner engine exhibit at the Chicago show, assisted by Leslie Bowman, Kinner service engineer. Robert Porter, chairman of the Kinner board of directors, also plans to be present.

An approved Kinner K5 engine will be on display in the Kinner company's booth, and another will be demonstrated at the Chicago Municipal Airport, mounted in a Wallace Touroplane. This plane has been purchased by the Kinner organization for demonstrating and engine service work in the Middle West. Several more airplanes will be purchased at the Chicago show for the same purpose, according to Mr. Kinner. In addition to the two engines being shown, there will be one of the improved Kinners mounted in the new American Eagle training plane. Another will be shown in the Taylor Brothers' "Chummy" monoplane.

Improved Head Used

The 1929 Kinner engine shows a number of detail improvements which promise longer life, smoother operation, and easier servicing. An improved head of aluminum alloy is bolted to the steel cylinder by 10 stud bolts, and has demonstrated excellent cooling in test runs. Improved rocker arms, and rocker arm axles give longer life, easier adjustment and at least 50 hr. between oiling of the rocker arm assembly. Quick removable rocker arm covers are dust proof and nicely streamlined, enclosing the entire overhead valve mechanism. The rear main bearing of the engine has also been increased in size, giving the engine smoother operation and longer life.

Bohnalite Castings are used exclusively in the improved model engine, and 75 per cent. of the small parts in the engine are made by the Excello company. A complete new set of metal patterns will assure absolutely uniform section castings in all future engines, while the factory is equipping with special jigs and tools which assure all future Kinner engine parts being completely interchangeable.

New torque stand testing equipment, a duplicate of the installation at the Bureau of Standards laboratory, is now in operation at the Kinner factory and all engines now being delivered are first given a 25 hr. test on this stand. About 20 hr. is run at 50 per cent. load, and then 3 hr. at full load, after which the engine is given a complete tear down inspection, reassembled and run at full load for two hours more before being approved for delivery.

Esline to Locate At Oconomowoc

MILWAUKEE, WIS.—Esline Company of this city and Barton, Wis., manufacturer of fabricated steel buildings, hangars and garages, will move to Oconomowoc within about ninety days, according to an announcement by Mr. Esline. The company plans to erect a large building at Oconomowoc at a cost of $40,000. The firm has employed one hundred people.

Nicholas-Beazley Firm Opens Export Division

MARSHALL, MO.—Closely following the announcement of the Nicholas-Beazley Airplane Co. of intentions to establish a nation-wide chain of distribution depots and to greatly expand their service in domestic aeronautical supply channels in order to facilitate domestic distribution of aeronautical supplies, Russell Nicholas, president of the company, has established an export division under the direction of W. F. Potter that will embrace the distribution of all aeronautical supplies and the Barling NB-3 all-metal monoplane in foreign countries with contemplated plans for the institution of foreign depots.

Although originally planned to promote Nicholas-Beazley products only, the export division, it is now announced, will also represent several other aero firms of this country.

Joins Northwest Airways

MILWAUKEE, WIS. — Martin P. Kelly, for the past year advertising director of Midwesco Theatres, Inc., has resigned his position to become traffic manager and publicity director of Northwest Airways, Inc., with headquarters in St. Paul. In entering the aviation field, Mr. Kelly is returning to his first love, having served overseas as a pilot with the 93rd Pursuit Squadron. He takes over his new duties December 1.

Dallas Firm Gets Charter

DALLAS, TEX.—The Dallas Air Taxi Co., has been granted a charter. The company was incorporated for $10,000. Members are Carza Wooten, Al Henley, and A. S. Crutcher. A Ryan Brougham has been purchased.

Aero Financing Begun By Commercial Credit

BALTIMORE, MD.—Commercial Credit Companies of Baltimore, Md., have announced their entry into the field of airplane financing. Commercial Credit is one of the largest independent finance companies in the country today, with a capital and surplus of $32,000,000 and offices located in 125 principal cities.

The airplane finance plan announced by Commercial Credit is quite similar to the automobile plan. The purchaser may take delivery of his plane upon making the down payment of one-third the total cost and the balance may be paid in equal monthly installments up to 12 months. All planes so financed are completely covered by insurance.

The company expects to do a large business in the airplane field, already having financed the sale of several tri-engined planes for one of the leading manufacturers. Negotiations are under way at the present time with prominent manufacturers.

The company was founded by A. E. Duncan, who is now the chairman of the board of directors.

Plane Sales Agency Formed at Buffalo

BUFFALO, N. Y.—The Frontier Aircraft Corp. is being organized here primarily to sell airplanes and to conduct a flying school, plans for which are now in the making. The Fairchild, Stearman, and American built Moth planes will be distributed by the firm, it is reported; with the growth of the organization, the company will add other makes.

The Frontier officers are: Lee M. Francis, formerly with the Merchant & Traders Trust Co., president, and Leo Chase, pilot, instructor and parachute expert.

Announcement now comes that William T. Lyman, who has been Colonial Western Airways traffic manager, has become associated with the Frontier corporation. Mr. Lyman has been a leader in the promotion of air mail in this city. He will be succeeded in his Colonial post by Goodrich K. Murphy, who has been company district manager at Hartford, Conn.

Miss Earhart's Avian Insured

NEW YORK, N. Y.—Through Aviation Protection, Inc., of this city, Miss Amelia Earhart has insured her Avro Avian plane against fire, crash, public liability, and property damage.

Offers Free Ground Course

MARION, IND.—A night school here is offering a free aviation course as part of its curriculum. Nearly 40 students are enrolled in the new class, which is taught by Lieut. R. L. Stephens.

Announce Early "T-P" Deliveries

Many Schools Placed Orders for New Swallow Plane

WICHITA, KAN.—Deliveries on the new training plane recently developed by the Swallow Airplane Co. will be made beginning January 1, according to a recent announcement by officials of the company. The first plane has been completed and test flown and preparations are being made at the Swallow factory to start production on this model. A number of orders already have been received from various flying schools.

The Swallow T-P is a two place single bay biplane bearing some resemblance to the production model Swallow. It has been designed for engines developing between 80 and 100 hp. A Curtiss OX-5 engine was used in the first plane which has a high speed of 90 m.p.h. and a cruising speed of 80 m.p.h. The weight of the new plane is 1270 lb.

Slow landing speed and rapid take off are the results of the specially developed airfoil section employed, and high load factors are retained despite the reduction of weight, and initial cost. The plane is to sell for $1,795 less engine and has been so priced as to be within the means of students completing flying courses.

Has Special Dual Control

Crash upholstering similar to that used in Army training planes is used in the cockpits and a special dual control device is standard equipment. This control system is so designed that a motion by the instructor will disengage the students' controls in the event of freezing to them. A straight axle type of landing gear is provided.

Application has been made to the Department of Commerce for an approved type certificate, the stress analysis already having been presented. The new plane will be exhibited at the International Aeronautical Exposition at Chicago. Among those contributing to the design features of the new plane are K. O. Jentsch and Dan Lake, of the Swallow engineering staff, and M. D. Kirkpatrick, factory superintendent.

The plane is the first of an important series of announcements, according to officials of the recently reorganized company.

Yeast by Plane To Isolated City

INDEPENDENCE, KAN. — Bakers of Independence received a delivery of 500 lbs. of yeast by air express while their town was completely isolated for four days during the flood resulting from torrential rains in the Southwest. People were clamoring for bread, which the bakers were unable to supply because of the lack of yeast.

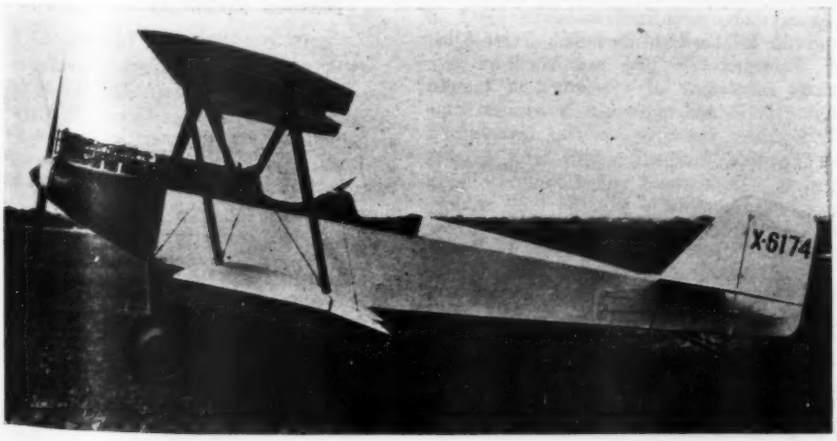
When the Kansas City officials of the Fleischman Yeast Co. were informed of this condition, they chartered a National Air Transport mail plane to fly a supply of yeast to the town.

Pilot Harry Lewis, bringing the supply, was forced to land in a hayfield six miles west of Independence, as the city airport was inundated.

Expansion of Midwest Brings New Directors

MONMOUTH, ILL.—Control of the Midwest Airways Corp., which was originally a local enterprise, but which under John H. Livingston, president, is being expanded into a chain of Illinois and Iowa ports, has passed to Mr. Livingston and a group of associates from Aurora, Ill., and Waterloo, Ia. Five local directors resigned last week and their places were taken by C. A. Morris, W. F Marshall and A. B. Chambers, Waterloo; and V. L. McIlvane and O. D. Larson, Aurora.

C. W. Buchanan, Monmouth, and Mr. Livingston comprise other members of the board. I. F. Dains, vice-president; Fred B. Pattee, Tom Hewitt, Chester Smith and E. P. Field resigned from the board.



Side quarter view of the new Swallow "T-P" training plane.

Further Restrain Army Exhibits

Growing Demand for Display Flights Brings New Restrictions

WASHINGTON, D. C.—Further restrictions designed to reduce the menace of exhibition flying by Army pilots are announced by the War Department in a revision of the regulations. The increased restrictions were considered necessary to the welfare of the fliers in view of the constantly growing demand for their services.

Declaring its continued policy of encouraging the establishment of airports and landing fields, the Department limits the participation at dedication ceremonies to those fields which are rated at least D-3-X by the Aeronautics Branch, Department of Commerce, except in ceremonies which may have particular military significance. Sponsors of the celebration must defray the expenses of the flying personnel, furnish suitable grades of oil and gas for flying to and participating in the celebration, and pay for servicing the planes during the trip. Exhibitions of wing walking, trapeze work, changing from plane to plane in the air, and similar performances are forbidden.

The regulations also limit Army fliers' participation to one airport in any city, unless the first field is abandoned or found unsatisfactory.

Patrician Damaged at Keystone Field by Fire

BRISTOL, PA.—The 20-passenger transport monoplane "Patrician," built by the Keystone Aircraft Co., was damaged by fire recently while final preparations were being made for the christening which was to take place the following day. The fire occurred while the plane was standing on the ground in front of the hangar. According to a statement issued following an investigation by Edgar N. Gott, president of the firm, the engines were not running and the gasoline lines and tanks had been drained so that only a small amount remained in the system at the time of the outbreak of the fire. The cover of the storage battery had been removed. A can of cleaning fluid, which had been placed on a shelf by a workman fell on the uncovered battery, spilling the fluid and short circuiting the battery. Sparks from the battery ignited the cleaning fluid and an explosion and fire resulted.

Axelson for Travel Air

WICHITA, KAN.—Travel Air Manufacturing Company of Wichita has just received its first Axelson engine, product of the Axelson company of California, and tests of the new engine will be made as soon as it can be mounted in a biplane.

Gets Corsair for Fog Experiments

Guggenheim Fund Buys Plane Doolittle Will Use in Test Work

MITCHEL FIELD, L. I.—The Daniel Guggenheim Fund for the Promotion of Aeronautics has accepted delivery of a high performance Vought Corsair fitted with a Pratt & Whitney Wasp. The plane, which has a high speed of nearly 160 m.h.p., was purchased for the use of Col. Charles E. Lindbergh and Lieut. James H. Doolittle, U. S. A., and the other trustees of the Fund.

The Guggenheim foundation has made conquest of fog one of its major projects to advance aviation, and as soon as "blind-flying" equipment and other special instruments are installed Lieutenant Doolittle will use the plane to conduct experiments in which every possible instrument or device likely to be of service in blind flying will be tried. Lieutenant Doolittle, one of the leading technicians in the Army Air Corps Engineering Division and rated as one of the most experienced test and research pilots in the country, was assigned by Gen. J. E. Fechet, Chief of Air Corps, to cooperate with the Guggenheim Fund.

Lieutenant Doolittle standing before the Guggenheim Corsair.

Progressive Tests Planned

The tests will be of a progressive nature, the devices being tried out first in good weather with the pilot closed in his cockpit, but accompanied by an observer-pilot to check and correct the flying of the plane. The "blind" pilot will attempt first to fly by instruments alone, then to land blind and with the aid of special instruments which will accurately register the exact height of the plane above the ground. The experiments will then be carried out in actual fog over a specified course and under adverse flying conditions.

This new "Corsair" plane to be used for these experiments, except for the removal of the armament and military equipment and making provisions for the special fog flying instruments, is a duplicate of the stock Vought "Corsair" naval service airplane which brought back to the United States four world records for speed and altitude performance. Over 135 of these planes have been delivered by the Vought Co. to the Government for new plane equipment for the aircraft carriers, battleships, and scout cruisers of the Navy's Fleets.

Has Special Equipment

Adjustable windshields make the cockpits of this particular plane wind-proof, giving the comfort of cabin planes while retaining the better vision and other desirable features of the open military cockpits. Adjustable seats are provided. Instrument boards and duplicate controls make it possible to fly the plane from either cockpit. The plane is fitted with disk wheels and a new kind of brake control developed by Vought engineers.

In order that the plane may be used for cross-country travel, a large baggage compartment has been provided and fitted with "Featherlite" airplane suitcases. Other cross-country equipment has been built in as well, so that long trips may be made in comfort.

Airmen Locate Stranded Cars

KANSAS CITY, MO.—Airplanes from the fields in this vicinity were successfully used in locating stranded motorists marooned by the floods of November 15-17, which covered great sections of Missouri, Kansas, and Oklahoma following a 37 hr. rain.

More Kitty Hawks in 1929

HILLSGROVE, R. I.—The Bourdon Aircraft Corp. has four Kitty Hawk biplanes under construction in its plant in the old Elizabeth Mills here. Pres. Allen P. Bourdon has just completed an airplane sales tour of a number of eastern flying fields and expects to announce some 1929 dealer franchises in the near future.

The 1928 production will total 10 airplanes. Department of Commerce tests have been completed and the 1929 production schedule is to be increased to 25 or 30 planes.

Republish Lighting Booklet

CLEVELAND, O.—National Lamp Works, of General Electric Co., Cleveland, has published a second edition of its booklet entitled, "Lighting of Airway Roofs."

Original Bach Plane Needs Few Repairs

SANTA MONICA, CALIF.—After 1,000 hr. of service, the original three-engined Bach plane was recently overhauled at the Santa Monica factory. The overhaul consisted chiefly of new wing covering and a new paint job, the plane being found in perfect condition structurally. Minor changes were made in the baggage compartment arrangement, stabilizer adjustment mechanism, and windshielding of pilot's cockpit, to bring the plane up to the design of the more recent models.

Planes Five and Six are now being rushed to completion for early delivery to the Pickwick Airways, which is planning to inaugurate a plane and bus service between Los Angeles and Chicago. These planes will carry Pratt & Whitney Hornet engines in the nose and a 150 hp. Comet engine under each wing.

According to the statement of L. Morton Bach, his company is now many months behind orders and will step up production to a plane a week as soon as possible after the opening of the new factory in January.

Fiscal Service Named Colonial Firms' Agent

NEW YORK, N. Y.—The Fiscal Service Corp., of which Capt. H. H. Railey is president, has been engaged to handle all publicity and public relations for Colonial Western Airways, and Canadian Colonial Airways, it is announced.

Captain Railey served as European manager for the flight of the Friendship in May, returning to America with Wilmer Stultz, Louis Gordon, and Miss Earhart in July. He is a member of the executive committee of the Byrd Aviation Associates, and is Commander Byrd's personal representative during the latter's absence in the Antarctic.

A. K. Mills, who accompanied Captain Railey to Europe and assisted him with the Byrd Antarctic Expedition publicity, is publicity director of the Fiscal Service Corp. The company has offices in Boston, New York, and Philadelphia.

Names Publicity Counsel

NEW YORK, N. Y.—The Consolidated Instrument Co. of New York announces the appointment of A. L. Greene & Associates, this city, as public relations counselors to direct, prepare, and disseminate all news relative to the advertising and sales operations activities of the company.

College Men in Naval School

OAKLAND, CALIF.—A total of 120 University of California students are enrolled in the naval reserve ground school conducted at the Oakland airport by Lieut. Comdr. F. B. Connell. Seven will be selected to receive flight training.

Universal Announces Expansion Program

HOLLYWOOD, CALIF.—Recent expansion of the Universal School of Aeronautics here, has included new and larger quarters for ground school instruction, a complete new series of courses in theory of flight and navigation, and in design and engineering; and plans for the early construction of a completely equipped flying school on the school's own flying field, according to Capt. T. C. Wilkinson, dean of the school.

There are reported to be 78 students now regularly enrolled in the ground work, which is being conducted under a system of semi-military discipline. The projected flying course is to include flying of various types of land and seaplanes, flying in varying conditions of fog and clouds, in cross country, night and day flying; and complete practical instruction in instrument flying and actual astronomical aviation.

The tentative field layout includes two 3,000 ft. runways paralleling each other, and a 2,000 ft. runway crossing these. Provisions for night lighting are planned, and hangars for the school planes and private operators will be erected, it is said, in addition to an engine room, wood shop, dual four foot wind tunnel laboratory and students' dormitory.

Texas Flying School Growth is Reported

FORT WORTH, TEX.—With the purchase of Texas Air Transport, Inc., operator of C.A.M. 21 and 22, by A. P. Barrett, business man and financier of the T.A.T. Flying School, a division of the company, reports rapid growth. A large appropriation has been set aside for the development of the school, which is under the direction of Jerry Marshall, former air mail pilot.

Fort Worth is the base of operations for 1,300 mi. of daily air mail flying, and this affords the students opportunity to observe efficient operation of a large commercial enterprise. Instruction is given on numerous types of new production commercial aircraft.

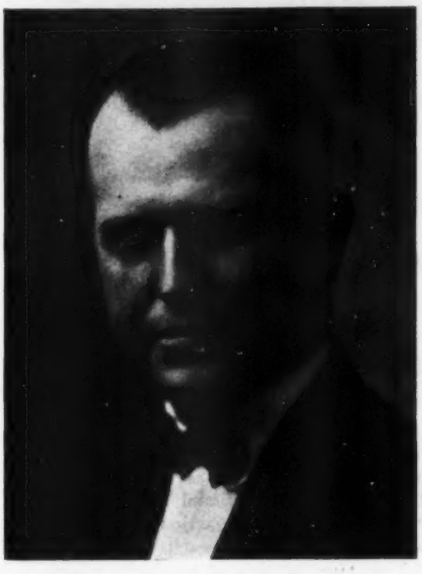
Tucker With Union Lines

PORTLAND, ORE.—Frank W. Tucker, formerly sales executive for the Union Oil Co. of California, has been named assistant manager of Union Air Lines, which operates West Coast Air Transport Co. and Capitol Air Lines. Charles V. Eakin, president of Union Air Lines, announced the appointment.

Night Course at Louisville

LOUISVILLE, KY.—Louisville Institute of Technology, Y.M.C.A. night high school here, is inaugurating a ground course in aviation.

To Plan Fields



Capt. Floyd Showalter, who heads Showalter-Associates, newly formed at Detroit to design airports.

Installing Machinery To Produce Barling

MARSHALL, MO.—The new production plant of the Nicholas-Beazley Airplane Co., Inc., is now completed and machine installations are being set up preparatory to quantity production of the Barling NB-3 all-metal monoplane, designed by Walter H. Barling, chief engineer.

P. O. Gibson, manager of production, planning to follow the line assembly method of production such as is customarily employed in automobile factories today, has patterned the installations along efficient lines, obtaining a plan that minimizes handling and needless motion as well as gaining greater machine production and less labor production than heretofore has been employed in aircraft construction.

The new building measures 75 x 300 ft. The production of the Barling NB-3 will utilize this entire building as well as the entire space of two other buildings, 75 x 140 and 50 x 151.

Add American Eagle Agents

KANSAS CITY, MO.—E. E. Porterfield, Jr., president of the American Eagle Aircraft Corp. of Kansas City, announces the addition of eight new contact dealers to the American Eagle sales force. They are H. A. Marsden, Hebron, Ind.; H. F. Gaylord, South Bend, Ind.; Lyle Tidwell, South Bend, Ind.; C. C. Tanner, St. Joseph, Mo.; Creasy Arms Co., Beach City, O.; Homer Gustafrom, Dover, O.; Russell P. Smith, Beach City, Ind.; and Carl C. Hendrichson, Atchison, Kan.

Metallic Dirigible Nearly Comp'ete

Aircraft Development Corp. to Test Alclad Airship Early in 1929

DETROIT, MICH.—The all metal dirigible being built by the Aircraft Development Corp. for the U. S. Navy is now 80 per cent. completed, and it is expected that the craft will be ready for flight by February or March, according to Carl B. Fritsche, general manager of the corporation.

It is reported that the MC-2, as the craft will be designated, will have a gross lift of about 12,500 tons, while the displacement of the hull is to be approximately 203,000 cu. ft. The metal used in covering the dirigible is alclad. Sheets of this material being used on the airship are but .008 in. thick. The hull from tip to tip is to measure 150 ft. It has not been determined as yet whether helium or hydrogen will be employed in the bag.

The metal dirigible will probably be powered by two Whirlwind engines. A gasoline capacity of 250 gal. with a cruising range of from 700 to 1,200 mi. is planned. It is expected the MC-2 will have a cruising speed of approximately 60 m.p.h and a maximum speed of at least 70 m.p.h. Metal plating on the bag will be smooth, but the tail surfaces are to be corrugated.

In developing the airship, engineers of the Aircraft Development Corp. have developed a special riveting machine said to be capable of setting 40,000 rivets in eight hours. These rivets are driven and clinched three rows at a time. The machine, it is said, was perfected by Edward J. Hill and Arthur G. Schlosser, members of the corporation's engineering staff. Hill and Schlosser won the Gordon Bennett International Balloon Race in 1927.

Boutwell to Command M.N.G.

BOSTON, MASS.—Capt. Louis Boutwell has been named to succeed Maj. Charles H. Wooley early next year as Massachusetts National Guard Air Service commanding officer. Major Wooley is being retired by statutory provision which limits commanding officers to five year tenure. Lieut. E. S. Beck has been promoted to captain to fill the vacancy left by Captain Boutwell's promotion.

Planes to be in Cinema Battle

OAKLAND, CALIF.—Thirty-two airplanes, the majority of them war-time Fokker D-7's and SE-5's, will take part in the battle scene about to be filmed here for the new picture, "Hell's Angels."

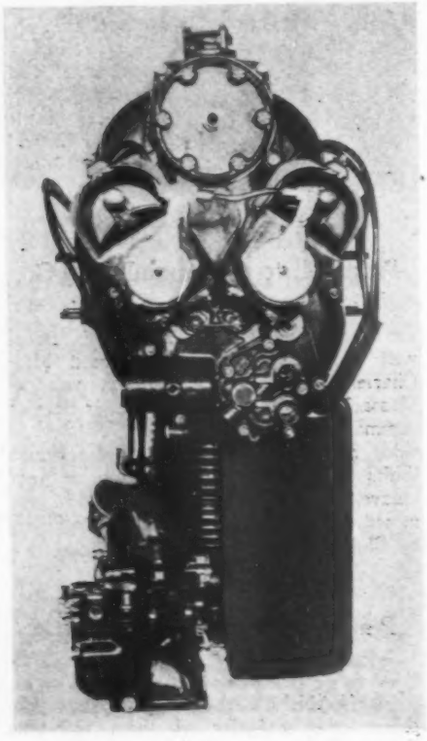
Michigan Firm Testing Engine

Plans Production of Four Cylinder in Line Power Plant

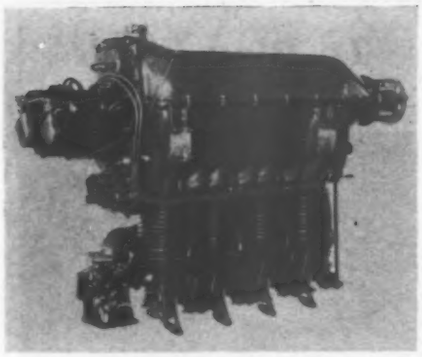
LANSING, MICH.—Plans are now being made by the Michigan Screw Co., for production of the "Rover" engine, which was recently designed by H. E. Morehouse, aeronautical engineer for the company. The engine has been block tested 55 hr. and flight tested 45 hr. in an Avro Avian plane and production is expected to start shortly after January 1. The Michigan Screw Co. has been engaged in the manufacture of airplane engine parts for twelve years.

The Rover is a four cylinder-in-line, inverted, air cooled engine of the four cycle type, following conventional practices and of simple and rugged construction. A bore of 3⅞ in. and a stroke of 5 in. give a piston displacement of 236 cu. in., the normal b.hp. being 55-60 at 1,800 r.p.m. The compression ratio is 5 to 1. The weight of the engine complete less starter is 210 lb.

The crankcase is a deep, well ribbed aluminum casting with webs providing support between each cylinder for both crankshaft and camshaft bearings. Integral passages are formed within the casting for the full pressure oiling system to all bearings. Four pads are provided on the sides of the casting for mounting. The crankcase is covered by a light, easily removable cover, which carries the breather



Showing installation of Scintilla Magnetos and Stromberg Carburetor on the "Rover" power plant.



Rear quarter view of the "Rover" engine developed by the Michigan Screw Co.

on top at the rear. All accessories are mounted on the timing gear cover at the rear and may be removed as a unit.

A single camshaft with integral cams, is supported in the crankcase and is driven by simple spur gearing from the rear end of which the tachometer drive is directly connected. Conventional push rod and rocker arm valve action is employed with two springs for each valve.

The five bearing crankshaft, which is of ample proportions and carefully balanced, is mounted in steel backed babbitted bearings. Crank pins and journals are bored out for lightness and oil is led to the crank pins through small steel tubes expanded into position. Propeller end thrust is taken by a deep grooved ball bearing. Connecting rods are duralumin forgings of H section with bronze bushed piston pin ends and babbitted big end bearings.

The cylinders are integral chrome-nickel iron castings, having a spherical form of combustion chamber with valves inclined at an angle of 25°. The skirts of the cylinders extend well into the crankcase, preventing oil from entering their open ends due to inverted running. The design has been arranged so that any one cylinder may be removed without disturbing any of the remaining ones.

The die-cast aluminum pistons have three rings at the top and one scraper ring at the bottom, also, a full floating piston pin using bronze end plugs.

Outside Tank for Oil

All oil is carried in an outside tank and a conventional two gear pressure pump delivers oil to all bearings under a pressure of 35-40 lb., means being provided for pressure regulation. A three gear scavanger pump drains each end of the crankcase independently, and returns the oil to the tank. A large oil filtering screen is arranged at the side of the engine where it may be easily removed for cleaning.

Dual ignition is provided, using two flange mounted Scintilla Magnetos, one being provided with an automatic impulse coupling which is inclosed within the engine to insure easy starting under all conditions.

The Stromberg NA-R3 carburetor, fitted with altitude adjustment and priming device, is arranged at the rear with manifolding along the side keeping the width to a minimum to simplify the cowling of the engine in the plane. Provision is made for a standard hand or electric starter.

Mail Stearmans For Robertson

Three Cyclone Powered Craft Ordered for St. Louis-Chicago Route

CHICAGO, ILL.—Three Cyclone powered combination mail and passenger Stearman biplanes have been ordered by the Robertson Aircraft Corp. for use on the mail route between St. Louis and this city, it is announced by Frank Robertson, president of the corporation. The present Travel Airs used on the mail route will be transferred to the St. Louis-Kansas City-Omaha mail route which opens the first of the year.

The Stearmans have been specially designed for Robertson and are to be delivered by Jan. 1, 1929. They will cost $20,000 each. A compartment to hold 600 lb. of mail will be placed directly behind the engines. Immediately to the rear of the mail will be a four passenger cabin. The seats will be arranged in checkerboard fashion which will give each passenger sufficient elbow and shoulder space. Besides the individual chairs, the cabin itself will be comfortably upholstered. The pilot will be in an exposed cockpit, which will give him excellent visibility to the rear and above the passengers.

Extensive increase in the use of air mail and the passenger service demand at Springfield and Peoria, Ill., will be amply cared for by the new craft. Whenever necessary, the cabin may be used for emergency mail, increases which will give additional space for 500 lb. of postal matter.

I. N. G. Presents Air Circus for Kiwanis

INDIANAPOLIS, IND.—An air circus featuring formation and stunt flying exhibitions by Indiana National Guard planes was given for members of the Indianapolis Kiwanis Club, at Mars Hill Airport recently. Parachute drops also were a part of the entertainment.

A speech for the occasion was delivered from a plane 1,000 ft. in the air. Speaking from an O-11 biplane of the 113th Observation Squadron, which has been equipped with a complete broadcasting and receiving set, Col. John S. Fishback, executive chairman of the local N.A.A. chapter, urged the interest of Indianapolis business men in the development of the city as an aviation center.

The Kiwanians were taken for short rides over the city in commercial planes brought in from the Hoosier and Capital airports.

New Factory by January

KANSAS CITY, MO.—The new American Eagle Aircraft Corp. factory, now rapidly taking form at Fairfax Field here, is to be ready, it is announced, by January.

Trade Tips

It Has Been Reported That—

—Since the city of St. Paul, Minn., has voted the necessary bonds, improvements are to be made at the airport to cost $200,000, including additional hangars. J. H. McDonald is Commissioner of Public Works.

—The Iowa Air Transportation Co., Boone, Ia., of which Ben Saunders is president and H. N. Streit is general manager, has purchased a field site and will have a hangar erected.

—Establishment of a $250,000 airplane factory at Alexander Airport, Colorado Springs, Colo., is reported to be under consideration by the Inblum Aeronautical Co., 410 West Fourth Street, Pueblo, Colo.

—Santa Monica Airlines, Inc., Santa Monica, Calif., is soon to begin construction of a $20,000 fliers' dormitory at the municipal airport.

—Bids for the erection of a 100 ft. by 80 ft. hangar at the Phoenix, Ariz., municipal field are being asked by City Manager C. E. Griggs. Provision for night lighting will follow in the near future.

—According to the Department of Commerce, commercial airplane demonstrating missions to South America would now be timely. Outside of military types, few planes have been displayed by the industry in this market.

—At Evansville, Ind., the Board of Works is preparing to advertise for bids calling for the erection of hangars and other work on the site of the municipal field.

—Information that M. Goncalves & Cia, 13 Rua Municipal, Rio de Janeiro, Brazil, desires an agency for a sport plane which may be converted into a seaplane, has been received by the Aeronautical Chamber of Commerce.

Guggenheim Contest Draws 12

BOSTON, MASS.—Twelve entries, including some of the most important airplane manufacturers in the country, have already been received by the Daniel Guggenheim Fund for the Promotion of Aeronautics in its safe aircraft competition, according to Harry F. Guggenheim, president of the Fund, in an address before the Boston Chamber of Commerce.

Three Fords for Pitcairn

DETROIT, MICH.—The Ford company recently received an order for three Wright powered monoplanes from Pitcairn Aviation, Inc., of Philadelphia, according to the Ford company's announcement.

Supreme Using Movable Tester

WICHITA, KAN.—As a testing block for use in passing air screws for Government approval, the Supreme Propeller Co. of this city has fitted a Liberty engine, geared two to one, on a movable chassis. The gearing provides sufficient r.p.m. to test any propellers according to Government specifications.

The new apparatus has been equipped with a water cooling system, allowing 24 hr. tests, and a self starter, which enables one-man handling. Several propellers are now undergoing tests.

Gates Flying Troupe Ends Tour of 17 States

TETERBORO AIRPORT, N. J.—Operating under the direction of The American Society for Promotion of Aviation, airplanes of the Gates Flying Circus and Aviation Corp., sent on the first cycle of a national "fly at cost" tour last December 1, have visited 75 cities in 17 states.

During this period, they have carried 89,583 passengers at dollar rates, have given 273 exhibitions before more than 1,500,000 persons and have flown cross country more than 6,000 mi.

The tour opened at Richmond, Va., December 3 last and ended in Paterson, N. J., November 22, after six day exhibition. The planes went as far south as Miami, Fla., as far west as Chattanooga, Tenn., and as far north as Bangor, Maine.

Laird Builds Special Plane for Chicagoan

CHICAGO, ILL.—A special six place cabin biplane has been built by the E. M. Laird Airplane Co. for George T. Horton, president of the Chicago Bridge & Iron Works. The craft is powered by a Pratt & Whitney Wasp; the interior is finished in de luxe style.

Mr. Horton, a Chicago aviation enthusiast and member of the Aero Club of Illinois, will use the plane principally for pleasure flying and for occasional business trips.

The Laird is now ready to be test-flown, and will be exhibited at the Chicago exposition in the space of the E. M. Laird Airplane Co. at the 131st Regiment Armory.

Becomes Ford Pilot

WICHITA, KAN.—Blaine Newcom of this city, who recently completed his Government flying course at Kelly Field, has accepted a position as pilot for the Ford Motor Co. at Detroit.

Reviews

The Book Department, Aviation, 250 West 57th St., New York City, can supply all books mentioned except government publications. N.A.C.A. publications may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

* * *

National Advisory Committee for Aeronautics Report No. 89, Forces on an Elliptic Cylinder in Uniform Air Stream, by A. F. Zahm, R. H. Smith, and F. A. Loudon.

Tests were conducted in the Navy Aerodynamic Laboratory, Washington, on four elliptic cylinders with fineness ratio of 2.5, 3.0, 3.5, and 4 to investigate the section characteristics suitable for streamline wire which normally has an elliptic section with a fineness ratio of 4.0; to learn whether a reduction in fineness ratio would result in improvement and to determine the pressure distribution on the model of fineness ratio 4.

National Advisory Committee for Aeronautics Technical Note No. 297. Preliminary Report on the Flat-Top Lift Curve as a Factor in Control at Low Speed, by Montgomery Knight and Millard J. Bamber, Langley Memorial Aeronautical Laboratory.

An analysis of existing airfoil data indicating definite relations between the shape of the lift curve and certain section dimensions. A section (N. A. C. A. 84), designed according to these empirical relations, was tested and found to have the desired flat-top lift curve combined, however, with low aerodynamic efficiency and high moment coefficients. It is stated that the shape of the lift at maximum lift appears to be of sufficient importance to justify additional investigation with the view of developing a section having satisfactory efficiency and moment characteristics. This report is the first of a general safety program.

It is concluded from the data available on the flat top lift curve, that it should make landing a safer and less difficult operation. This curve, when combined with a small center of pressure movement at large angles of attack should reduce the tendency to dive after a stall. It has also less tendency to spin and is less apt to fall off on one wing after a stall at low altitude.

Report Eaglerock Sales

COLORADO SPRINGS, COLO.—In the first 10 months of 1928 the Aero Corporation of California, Eaglerock distributor at Los Angeles, sold 42 Eaglerocks, or $109,121 worth of planes. Massachusetts Airways at Springfield, Mass., sold 18 Eaglerocks valued gross at $51,066, and the Charles Flying Service, Richmond, Va., sold 15 Eaglerocks, or $45,970 worth.

Other leading distributors and their sales for the period were: Wyoming Airways Corp., Casper, 14 planes, $42,802; Kysor Eaglerock Sales Co., Niles, Mich, 13, $36,685; and Rapid Airlines, Inc., Rapid City, S. D., 15, $39,812.

AIRPORTS AND AIRLINES

New Field Open At Los Angeles

Metropolitan Airport Announces Facilities for Flying Program

LOS ANGELES, CALIF.—Planes may now land on the new Los Angeles Metropolitan Airport, a private development in the San Fernando Valley north of Los Angeles, according to the announcement of Clarence Ketchum, secretary.

Two runways have been graded, rolled, and seeded in grass, which is now sprouting, making the runways easily distinguishable from the air. Each is 1000 by 4000 ft., and complete drainage assures safe landings under any weather conditions. The runways extend north-south, and east-west, crossing approximately at the center.

Wind cones are installed on the field boundary and the center tower, while beacons and flood lights are provided for night operation, giving the field a Class B rating at the present time. Housing for planes is also available, the first hangar unit, 130 by 101 ft., having been completed. Construction of this hangar is of steel and hollow tile with a concrete floor. Approximately 13,800 sq. ft. of floor space is provided, of which about 2000 sq. ft. is devoted to offices, reception room, and pilots' quarters.

Has Richfield Station

A complete fueling station has been installed by the Richfield Oil Co., with a large roof under which the planes taxi for fuel or service. The Richfield Co. has announced plans for the early erection of a neon beacon and Richfield sales village.

Work, furthermore, is progressing rapidly on the new Bach $40,000 factory of 23,000 sq. ft. floor space, which is scheduled for completion here during December.

Perhaps the most advanced feature of this new airport development is the centrally located control tower, just completed. This tower contains five stories, about 1500 sq. ft. of floor space, and is 54 ft. high.

Has Administration Tower

The first floor will be devoted to the field office where registration of incoming planes will be effected; the second floor is to contain the weather forecast office; the third floor contains the field executive office; the fourth floor the radio room; and the fifth floor is devoted to the dispatcher's office, with a complete loud speaker and siren signal system provided.

A considerable amount of space is being reserved at this field for the establishment of aircraft factories, service depots, and flying schools.

Utica Airport Bonds Valid

ALBANY, N. Y.—Further weight is added to the numerous favorable judicial opinions already on record with the decision of the New York Supreme Court ruling that the City of Utica was within its rights in the issuance of $120,000 in bonds for the purchase of an airport.

The Appellate Division of the Supreme Court in the Fourth Department decided, in answer to a taxpayer's suit that this was not a city purpose within the meaning of the state constitution, that the creation of an airport is as much a city purpose as the building of a bridge, and that an airport may no longer be classified as an experiment.

Maddux First to Base At Glendale Airport

GLENDALE, CALIF.—Maddux Air Lines will be the first commercial air transport company to base at the new "Grand Central Air Terminal" being developed at Glendale, according to the announcement of Pres. J. L. Maddux. Three divisions are now operated by Maddux and it is said that a material expansion is planned as soon as the new terminal is ready for use. Beacons being installed between Los Angeles and San Diego will make it possible to conduct regular night flying between these points in the near future.

Complete plans for the development of the airport under the direction of C. C. Spicer and associates includes two runways from 2,500 to 3,200 ft. in length, a large passenger depot serving the railroad line which bounds the field on the east and the runways which will be reached by a covered concrete runway making it possible for the planes to taxi under cover from the main field directly to the passenger depot.

Cut Chicago-Twin Cities Fare

MINNEAPOLIS, MINN.—The fare between the Twin Cities and Chicago on the three Wasp engine Ford plane, operated by the Northwest Airways, air mail contractor, on the daily non-stop run between the two terminals, has been reduced from $45 to $40.

Deny Curtiss Field Change

GARDEN CITY, L. I.—Concerning current reports that the Curtiss company plans removal of Curtiss Field to a tract nearer New York City, a statement has been issued that though a number of sites have been examined, no decision of this kind has been made.

Form Aero Conntry Club at Indianapolis

INDIANAPOLIS, IND.—An aero country club has been formed here by a group of local representative business men, and incorporated under the name of Flying Club of Indianapolis. Organization is under the direction of Fred. C. Caldwell, who is an organizer of golf and athletic clubs throughout the country.

The club's board of directors and advisory board are as follows: Lieut. Walter R. Peck, C. A. Kinder, Robert H. Stockwell, W. Carleton Best, Harry M. Agerter, Dr. Karl R. Ruddell, Earl R. Cox, Dr. J. W. Wright, Capt. H. Weir Cook, Walter Evans, and Capt. Charles Cox.

An eighty acre field has been leased on Kessler Boulevard opposite the Broadmoor Country Club, in the northern section of Indianapolis. Two buildings now on the field will be purchased; one, a new house, will be remodeled slightly for a clubhouse; the other, an old building will be made into a repair shop and service quarters. A five plane hangar has been put under construction.

The founder membership is limited to 300; membership fee is $500. Members, it is reported, are entitled to any number of hours of flying instruction that they desire, with only a small service charge for use of plane; and club planes will be available to members for cross country trips, within an approximate 200 mi. radius, at a cost greatly reduced.

Marion, Ind., Is Airmarked

MARION, IND.—For the purpose of air guidance, a large sprinkler tank at this city has been painted in bright orange and black, checkerboard style. The tank is topped with the inscription "Marion, Ind." in 10 ft. letters. A seven foot arrow points toward the flying field.

Runways Completed at Enid

ENID, OKLA.—Runways have been completed at Enid's new $50,000 airport, the area including 400 acres. Two runways have been completed north and south and east and west. Each is 400 ft. wide and 2,500 ft. in length. One private hangar has been completed.

Michigan Service Earlier

CHICAGO, ILL.—Inauguration of the new air mail service between Chicago, Pontiac, Mich., and Flint, Mich., which was originally announced for December 1, was advanced to November 27, by order of the Post Office Department.

Bennett Now Operates Three Branch Fields

KANSAS CITY, MO.—In order to provide proper winter training for its students, the Bennett Flying School, whose main field is located here, is operating three municipal airports, one at Okmulgee, Okla., one at Pittsburg, Kan., and a third at Coffeyville, Kan.

Many of the men have been transferred to Okmulgee, while five are taking training at the Pittsburg field, which is managed by Roland Guthrie. New hangars are being erected at this site. Seven students, furthermore, were recently soloed at Coffeyville. Instructor John Armstrong manages this field.

Bennett students at any field, including that at Kansas City, are transferred from one airport to another by plane whenever weather conditions are not favorable at the home port.

At the Kansas City school a night course has been added enabling students taking ground work to be employed during the day. Transport Pilot, Limited Commercial, and short preliminary courses are offered by the Bennett school.

Denver Beacon

One of the latest guides for fliers—the 9,000,000 candlepower rotating aero beacon at the apex of the lofty Daniels and Fishers Tower, Denver.

Concerning Aid Of Airmarking

INDIANAPOLIS, IND.—A request has been issued by the American Legion News Service, Legion National Headquarters, this city, that all pilots inform the Service of instances in which a town's airmarking has aided them in flying. F. C. Condict, director of the Publicity Division, states that details of the cases are especially desired for use in newspaper publicity material aimed to inspire more towns to enter the "mark your city" campaign.

Install Anenometer At La Grande Field

LA GRANDE, ORE.—As an aid to winter flying of mail pilots over the Blue Mountains in Eastern Oregon, the United States Weather Bureau has installed an electric anenometer here. Roy Coost, of Washington, D. C., set up the instrument.

Ground speed of winds on the mountain section of the course is told by listening with ear phones to the anenometer's electric interrupter. Distinct buzzes are heard. They are timed for one minute, and the number registered gives the wind velocity.

A mercury barometer and thermometer have also been installed in the station. Balloon stations are already in operation at Boise, Ida., and Salt Lake City for the line, which is from Pasco, Wash., to Salt Lake City. The Government plans to equip the whole line so as to furnish complete weather reports for the mail pilots.

Northwest Line Mail Reported Increasing

MINNEAPOLIS, MINN.—More than 1,500 lb. of air mail will be carried on the line operated by Northwest Airways between the Twin Cities and Chicago during the month of November, Arch Coleman, Minneapolis postmaster, declared recently. In October 1,367 lb. were transported, while in August 1,022 lb. were carried. Loads have more than doubled since the advent of the new rates.

New air mail lines from Minneapolis to Winnipeg, Kansas City, and the West Coast, probably Spokane, will be inaugurated in the near future, he said. Twice daily air mail service from here to Chicago was started recently, planes leaving and arriving both morning and afternoon.

Ponca City Enlarges Field

PONCA CITY, OKLA.—Ponca City is to add 250 additional acres to its airport for which 160 acres were recently bought. This will give the airport a total of 430 acres.

Kansas City and Cleveland Joined

St. Louis is Included in Newest Air Service Inaugurated by Robertson

KANSAS CITY, MO.—Air passenger service between Kansas City and Cleveland, via St. Louis, has been inaugurated by the Robertson Aircraft Corp. division of the Universal Air Lines System. The first plane to take off on the trip, a Ryan Brougham, started in a heavy rain storm but made the flight successfully.

The plan of the company is to supplant the Ryan planes with tri-engined Fokkers in the future. The route will extend to Columbus, O.

The Beacon Airways, Inc., will act as agent for the new line here. The Kansas City-Cleveland schedule follows: Leave Kansas City 8:30 A.M., arrive St. Louis, 11:10 A.M.; leave St. Louis 12:30, arrive Chicago 3:30; leave Chicago 4 P.M., and arrive Cleveland 7:45 P.M. The fare to St. Louis is $30 with a round trip ticket selling at $55.

The opening of the new line was marked with ceremonies in which Mayor Albert I. Beach of Kansas City sent a golden key to Mayor Victor J. Miller of St. Louis.

Milwaukee-Green Bay Service to be Opened

WASHINGTON, D. C.—Effective December 15, the Northwest Airways, Inc., of Minneapolis, Minn., which operates the Chicago-Minneapolis air mail route, has been authorized to extend its service from Milwaukee, Wis., via Fond du Lac, Oshkosh, and Appleton to Green Bay, Wis. The distance between the two terminal cities is 100 mi.

The daily schedule, which will give residents of the Fox River Valley direct connection with the overnight service from New York and return, as well as that of the continental route, follows:

Southbound—Leave Green Bay 3:45 P. M., leave Appleton 4:05 P. M., leave Oshkosh 4:20 P. M., leave Fond du Lac 4:35 P. M., arrive Milwaukee, 5:10 P. M.

Northbound—Leave Milwaukee 7:30 A. M., leave Fond du Lac 8:10 A. M., leave Oshkosh 8:25 A. M., leave Appleton 8:40 A. M., arrive at Green Bay 9 A. M.

To Enlarge Bloomington Field

BLOOMINGTON, ILL.—Enlargement of the Bloomington Airport and extensive improvements are predicted as a result of negotiations between Herman Will, proprietor of the field, and Bert Ison, representing the Robertson Aircraft Corp., relative to establishment of the city as a stop on the Chicago-St. Louis passenger service route. The port is five miles north of town.

Denies Air Mail Fire Risk Great

Postal Authority Refutes Charge With Statistics for Past 10 Yr.

WASHINGTON, D. C.—In response to general propaganda which has resulted in many requests that the Post Office take steps to provide fire safeguards for air mail containing checks, securities, and other valuables so that the insurance rates will not be increased, Acting Postmaster General Irving W. Glover has issued a denial that the fire menace in transporting air mails exceeds the hazards provided by other modes of transportation.

To strengthen his declaration that the danger is not greater, if as great, as that attendant upon shipments by steamship or railroad, Mr. Glover called attention to the recent sinking of the *Vestris* in which 1,079 sacks of mail were lost, an amount far larger than the total of all the air mail destroyed by fire during the 10 yr. operation of the air services. He pointed out that a fire just outside of New York a year ago destroyed a mail car containing a far greater amount than has been lost in a similar manner during the entire operation of air mail.

Fireproofing Impractical

In response to the suggestion for providing fireproof compartments for valuable mail, Mr. Glover replied that several years ago the Department conducted an exhaustive research into the subject and that the conclusion was developed that no asbestos or chemically treated substance was available which would withstand the terrific heat of a gasoline and oil fire sufficiently to protect the contents from destruction.

Replying to the letters that viewed the insurance situation with alarm, the Post Office executive sent a table of statistics indicating the fiscal years ending June 30, pounds carried, and pounds lost in transit, respectively, as follows:

1918, 17,831, 0; 1919, 230,251, 258; 1920, 526,578, 1,025; 1921, 1,120,852, 376; 1922, 1,224,723, 164; 1923, 1,696,896, 0; 1924, 1,500,034, 0; 1925, 232,514, 155; 1926, 383,243, 80; 1927, 1,032,727, 327; 1928, 1,945,252, 810; (July 1 to Oct. 31, 1928), 1,524,865, 1,235.

Greenville, Tex., Leases Field

GREENVILLE, TEX.—This city has leased, with option to purchase, 183 acres approximately four and one-half miles from the business center on State Highway 1, National Highway 67, for the establishment of a municipal airport. Planes have already landed at the field, which is now being levelled. The tract is in charge of Mayor Joseph F. Nichols, who was executive officer at Love Field, Dallas, during the war.

Parks Airport To Have Hotel

ST. LOUIS, MO.—A modern hotel of 60 rooms, is to be the next addition to Parks Airport, according to an announcement by Harry P. Mammen, president of Parks Air College The rooms are to be equipped with bath and running water and the building is to conform on a small scale with standard hotel practice. It is designed to fill the need for hotel accommodations among instructors at Parks Airport, students, visiting pilots, and officials of the new Parks Aircraft, Inc., factory, now under construction.

Hangars for Lincoln Air Lines Complete

LOS ANGELES, CALIF.—Specializing in the sales and servicing of Monocoupe planes, the Lincoln Air Lines, located on Mesa Drive, Los Angeles, has just completed the erection of two modern hangars capable of housing 12 Monocoupes; and a completely equipped engine repair shop 30 by 40 ft., with concrete floor, according to H. G. Hills, manager of the company. A stucco office and display hangar is also to be erected facing the adjoining boulevard.

Monocoupe planes were sold recently to Paul Whittier of the Whittier Oil Co. and to the Stamford Clothing Co. of Hollywood. The May Company's six place Travel Air is now being operated from this field.

Grand Forks Field Facilities Increased

GRAND FORKS, N. D.—Facilities at the Grand Forks Airport have been greatly increased within the last week with finishing of grading of a new highway leading directly past the airport entrance. The new highway comes in directly off a heavily travelled state highway leading into Grand Forks and is expected to greatly boost traffic to and from the airport.

A well built 12x18 ft. warming house and tool shed has also just been completed and will be used in giving instruction to a class of air students here this winter. Al Berglund, local pilot, who recently took transport license examinations, is giving the instruction.

Parcel Contract to Union

PORTLAND, ORE.—A contract with the Union Parcel Service of America, operating in Portland, Seattle, San Francisco, and Los Angeles, was recently signed by Union Air Lines. The aero line company will act as air express agent for the Parcel firm, the contract to go into effect the first of the year.

Missoula County Buys Tract for an Airport

MISSOULA, MONT.—Missoula County has bought 110 acres near the fair grounds, about three miles from postoffice, and dedicated it as Missoula Municipal Airport. It is an L-shaped tract on which three runways have been laid out. As it is absolutely level the runways' widths did not have to be graded. The north-south take-off is one-half mile long as well as the east-west, but the northeast-southwest runway is three-quarters of a mile long.

The Johnson Flying Service and School of Aviation has a small hangar at the field. Fourteen students are learning to fly. The machine shop located in the hangar is fully equipped for complete engine overhaul.

Robert R. Johnson, manager-pilot, makes scenic flights to Kalispell over the Missoula Mountain range, Flathead Lake, Glacier National Park and the Lewis-Clark River.

Weather Information Offered by Auto Club

LOS ANGELES, CALIF.—Complete weather service by telephone to anyone calling the Los Angeles office of the Automobile Club of Southern California is now offered following the installation of a telegraphic printing machine at club headquarters. Last minute weather information covering the entire Pacific Coast, including the state of California, Oregon, and Washington is provided.

Starting at 6:30 A.M., reports are available every 90 min. until 8 P.M. These reports cover wind direction, velocity; temperature and barometer readings, visibility, ceiling, etc. Wind velocity and direction is given for every 600 ft. up to an altitude of 18,000 ft., ceiling permitting.

Kalispell Acquires Field

KALISPELL, MONT.—This city has acquired 140 acres adjacent to the city limits and has made request to the Department of Commerce to send in an aeronautical engineer to lay out its runways. Fred S. Buck of Kalispell is conducting scenic flights over Glacier National Park.

Mr. Buck is building two hangars. Gas and water service is available as well as minor engine repairs. There is no charge for using the field and all air travellers are welcome, Mr. Buck states.

Opposing Low Flights

BUFFALO, N. Y.—A movement to prohibit airplane pilots from flying low over Kenmore and Tonawanda townships has been launched by the Kenmore Property Owners Protective Association. Members of the association are conferring with officers of aircraft and flying school corporations.

Culver City Airport Under Development

LOS ANGELES, CALIF.—Intensive development of the Culver City Airport is being undertaken by Flying, Inc., according to A. E. McManus, Jr., joint manager of the airport with W. G. McAdoo, Jr., son of the former Secretary of the Treasury. The entire interest of the Buhl-Pacific Aircraft Co. has been purchased outright, and the name, Culver City Airport, has been approved as official by the Culver City Council.

Improvements at the field include the immediate erection of three 70 by 80 ft. modern hangars, a rolled and oiled crushed rock apron in front of the hangars, and the extension of both north-south, and east-west runways.

An innovation in airport facilities is to be the erection of a large administration building providing offices for airplane distributors who may make their headquarters at this field. All facilities will be provided for service of distributor's planes and for office cooperation in handling distributor's business at the airport.

Flying, Inc., will specialize in student training and retail sales. The Los Angeles dealership has been obtained on Monocoupe and Monocoach planes, Buhl products, the American Moth, and the Kreider-Reisner Challenger. Student instruction is being given in the Monocoupe. Harry Ash is chief pilot, and Bill Randall is chief mechanic. Both men have had several years of experience at Kelly Field, Tex.

Plans Completed for Joliet Municipal Field

JOLIET, ILL.—William Fay, member of the airports commission, appointed by Mayor Sehring has announced that plans have been completed to establish a municipal field on the Wilhelmi tract south of town with two licensed pilots, Arthur Chester of Downers Grove, and K. M. Oliver of Chicago, in charge. A 100 ft. marker is to be placed in the center of the field and efforts are being made to obtain beacons from the Government. Two airplanes wil be kept at the field at all times for commercial taxi service. Public subscription will be sought to raise funds to finance operation of the field.

U. S. Leases Indiana Field

SHELBYVILLE, IND.—Forty-six acres, northwest of Shelbyville, have been leased by the Government for an emergency field on the Cincinnati-Chicago air mail route. Work on the field will begin shortly.

Sets Building Limits

INDIANAPOLIS, IND.—A resolution opposing construction of airplane hangars or the location of landing fields within 500 ft. of boulevards has been adopted by the Board of Park Commissioners here.

P. A. T. on Seven Day Basis

PORTLAND, ORE.—The Pacific Air Transport company, operating the Seattle-Los Angeles air mail route, will go on a seven-day week schedule December 1. Since the beginning of the service the planes have been flying six days a week, with Monday off. Two new Boeing planes, similar to those now in use, will be added to the fleet for the new service, according to L. G. Hubble, division superintendent for the line.

Souvenir Mail Booklet For Oakland Visitors

OAKLAND, CALIF.—To promote the use of air mail, an attractive booklet weighing slightly less than one ounce has been prepared by the Oakland Board of Port Commissioners. The cover of the booklet has an air mail motif and is made so that it can be sealed like an envelope. Two of the book's 16 pages are reserved for written messages and the balance describes Oakland Municipal Airport in word and picture.

The booklets are stamped and sold to airport visitors for the price of the air mail stamp. Boeing Air Transport, which carries the mail between Oakland and Chicago and Pacific Air Transport, carriers of air mail on the Seattle-Oakland-Los Angeles route, are cooperating with the port commissioners in distributing the booklets.

Two thousand of the booklets were purchased and mailed by Oakland airport visitors November 11, when members of the Boeing traffic department spent the day at the field explaining the workings of the air mail and acting as guides to those who inspected the air mail planes. It is planned to continue these "air mail days" each Sunday.

Remove Power Lines To Clear Flying Zone

SAN FRANCISCO, CALIF.—Cooperation in the matter of developing airports at several California towns is being given by the Pacific Gas & Electric Co., through removal of power lines from the vicinity of airport sites.

The company has swung its line at Redding, three blocks northward, entailing considerable reconstruction, in order to leave Benton Field free from obstruction in its approach from that side. The company has also agreed to move its power line at Red Bluff nearly a mile north, to clear the approach to the new field that city is constructing.

Operates Boltz Field School

MANSFIELD, MASS.—"Bud" Robertson reports that seven students are taking flying instruction in his course at Boltz Field, a mile and one-quarter from this city. Robertson flies a Waco 10.

Report Progress At Schenectady

Three Organizations Operating at Well-Equipped Flying Field

SCHENECTADY, N. Y.—An administrative building, two hangars, each with a lean-to, and equipment which includes a rotary beacon, a complete set of boundary, obstruction, and landing lights, gas and oil servicing equipment, electric lights, as well as miscellaneous accessories for prompt handling of night and day air traffic are now among the assets of the Schenectady Airport, according to John S. Horn, president of the local chapter of the N.A.A.

The Schenectady Airport, in contrast to most of the municipal fields of the surrounding cities, is owned and operated by a commercial company established for that purpose by popular stock subscriptions, the Schenectady Airport, Inc.

Intercities Airways Service, under the management of Victor A. Rickard, was the first organization to begin operating at the airport. From a start with one Standard training plane the company has grown until it now possesses a Stinson-Detroiter and two Wacos which are in constant demand for local and cross country flights. Since January 1 the Intercities Airways Service has flown some 50,000 mi. without mishap. A second company to locate at the Schenectady field was the Colonial Western Airways, which inaugurated the Albany-Cleveland daily service on June 1.

Six Have Soloed

A third organization to establish headquarters here was the Schenectady Flying Club, formed in the early summer with the aid of the local N.A.A. chapter. The club has 25 active members and owns a Standard J-1 purchased primarily for training purposes. Six members of the club, including one girl, have made solo flights.

Fifteen Schenectady-trained students, aside from the flying club members, have qualified at the airport since Spring, and seven of these have acquired planes of their own.

Grand Forks Beacon Lighted

GRAND FORKS, N. D.—A powerful rotating beacon located on the roof of the North Dakota state mill and elevator here now informs night fliers that they are on the outskirts of Grand Forks. The beacon, which is visible for a distance of about 50 mi., makes two rotations per minute.

The new light, in connection with the recently painted airport marker on the roof of the mill, is expected to be a valuable aid to pilots. The marker consists of the words "Grand Forks" in orange colored letters about 20 ft. high.

Seattle-Juneau Line is Planned

Union Air Lines, Inc., to Extena Its Service to Alaska About May 1

PORTLAND, ORE.—Union Air Lines, Inc., will inaugurate a commercial air service between Seattle and Juneau, Alaska, about May 1, Charles V. Eakin, president, has announced. A subsidiary company will operate the line, he said.

Stops are planned for Ketchikan and Petersburg. Flying boats carrying from eight to fourteen passengers will be used, with the Sikorsky make under consideration. Mr. Eakin hopes to get an air mail contract for the line. The subsidiary will be capitalized at $350,000.

The extension would give Union Air Lines a coast route from Juneau to San Francisco. West Coast Air Transport now operates between Seattle and San Francisco. Pickwick Airways, now being organized, contemplates carrying the line south to San Diego and east, eventually to Chicago. Pickwick will be a sister company to Union Air lines.

Union also operates Capital Air Lines, a Sacramento Valley line running into San Francisco. West Coast, the original company, started its Seattle-San Francisco service on May 5 of this year.

To Confer on Airport Legislation at Danville

DANVILLE, ILL.—The Danville Association of Commerce has sent out invitations to mayors, secretaries of commerce, airport officials, and members of the state legislature to attend a state-wide aviation conference to be called here shortly to discuss legislation to permit municipalities and towns of the state to establish and maintain municipal airports. Under the present statute cities may found such ports under the park district act but can not realize any revenue from sale of gasoline and service.

M. C. Meigs, Chicago, chairman of the aeronautical development department of the Illinois Chamber of Commerce will participate in the meeting. Representatives of the Aeronautics Branch, Department of Commerce will also attend the session, it is reported.

To Make Airport Study

OKLAHOMA CITY—Twelve large cities are to be visited by the local Chamber of Commerce inspection committee prior to making plans for a new airport for this city. Dallas, Fort Worth, Tulsa, Wichita, Kansas City, St. Joseph, St. Louis, Chicago, Cleveland, Columbus, Toledo, and Buffalo are the cities.

Sorts Air Mail While in Flight

OAKLAND, CALIF.—Gerald Worthley, Oakland airport mail transfer clerk, recently demonstrated the feasibility of sorting mail on the wing, when the northbound Los Angeles-Oakland Pacific Air Transport plane arrived too late to connect with the northbound Oakland-Seattle craft. Worthley sorted some 300 lb. of mail with ease, while Johnny Johnston, pilot, took the mail to Davis to make connections with a northbound train which had left Oakland several hours earlier.

Activity is Reported At San Diego Airport

SAN DIEGO, CALIF.—The San Diego Air Service Corp. has added to its equipment a gasoline truck which can be sent to any point on Lindbergh Field, or if necessary, elsewhere in this region. The pump has a capacity of 20 gal. per minute.

The corporation was first to secure a lease on the new municipal airport and now operates its school and other service from that field. Flying equipment consists of two new Travel Air planes, powered with 110 hp. Warner Scarab engines. Doug Kelley, former pilot for the Mahoney Aircraft Corp., is chief pilot.

This month marks, also, the first anniversary of the voting of $650,000 in bonds for establishment of the airport. At present dredges are pouring mud into the space which is being made into the airport. The present runway measures 200 ft. wide at one end, 500 ft. wide at the other and is 2,500 ft. long.

Roy Campbell, Jr., vice president of the corporation, states that he hopes to set a new standard in selling and teaching flying on the school's established basis of equal stress on air and ground training.

Crawford Establishes Branch

LONG BEACH, Calif.—Following recent expansion of the Venice plant, the Crawford Airplane Supply Co. has established a branch at the Long Beach Municipal Airport, under the direction of W. B. Zellick, Jr. Space has been rented in the hangar of Al Ebrite's Flying Service, and a complete stock of supplies will be kept on hand there.

M.N.G. Gets Detroit Hangar

DETROIT, MICH.—The first hangar, now being constructed on Detroit's newly acquired municipal airport, will be turned over to the 107th Observatory Squadron, Michigan National Guard, officers of the squadron announced recently.

Universal Effects Faster Schedule

Announce Saving of Three to Five Hours Over Air-Rail Routes

CHICAGO, ILL.—A new faster air-rail schedule between New York, various other Eastern cities on the New York Central Lines, and important cities of the Middle West was put into effect Thursday, November 22, by Universal Air Lines System, reducing the present air-rail schedules from three to five hours, according to Louis H. Piper, president of the air lines. Travelling time to St. Louis is reduced five hours and to Minneapolis and St. Paul, three hours over the previous schedule.

Rail passengers from Eastern cities westbound to St. Louis, Kansas City, Chicago, and the Twin Cities can shorten their travelling time by boarding night trains at Cleveland, where they connect direct by bus with Universal Air Lines System planes leaving Cleveland at 6:50 A.M. Eastern Time, arriving in Chicago at 8:35 A.M. Central Time, there connecting with Universal System planes leaving at 9:00 A.M. for St. Louis, Kansas City, Minneapolis and St. Paul, and Rochester, Minn. The planes arrive in St. Louis at 12:15, Kansas City 5:15, Rochester, Minn., 11:40, St. Paul 12:20, and Minneapolis 12:30.

Time Saved for Business

This new service connects the Eastern Coast with the Middle West with only one-half of a business day spent in travelling, thus saving the other half for the transaction of affairs in Middle West cities.

A similar fast air-rail schedule has been arranged for return to the East Coast, with planes leaving Minneapolis, St. Paul, and St. Louis at noon for Chicago where connections are made with planes for Cleveland, which arrive to connect with night trains over the New York Central Lines for New York, Boston, and other large Eastern cities.

All schedules of the Universal System allow time for breakfast, lunch and dinner at junction points. The Universal Air Lines System, it is reported, operates planes over scheduled routes covering approximately 4,000 mi. daily.

To Enlarge Oneonta Field

ONEONTA, N. Y.—D. F. Keyes, owner of the land to be used for this city's airport, has purchased two adjacent farms, with an aggregate area of 125 acres, to add to the original tract. This addition will provide sufficient space to make north-south runways of about 3,500 ft. in length, and east-west runways of more than 4,000 ft. in extent. Work will be started next spring to place the new ground in shape for use by the airport.

FOREIGN ACTIVITIES

Use Stinson-Detroiters In Peru-Chile Service

LIMA, PERU—Using two Stinson Detroiters, a weekly mail and passenger service has been established between Lima and Arequipa, Chile, by the Faucett Aviation Co. A plane leaves Lima every Friday morning and arrives at Arequipa the same evening, cutting two days from the time previously required by the journey between Lima and La Paz or Buenos Aires.

The plane reaches Arequipa in time to make connections with a Friday night train for Lake Titicaca, and thus the passenger may reach La Paz 37 hr. after leaving Lima. Or if he desires to go to Buenos Aires the journey may thus be shortened from eight to six days. The voyage from Lima to Buenos Aires via Valpraiso requires nine days.

The mail rates are the same as for the Lima-Talara weekly service, 50 centavos ($.20) in addition to the regular 10 centavo postage.

The Faucett company is financed locally and its only pilot is Elmer Faucett, an American citizen, who has long been identified with aviation in Peru.

Recent Air Progress Reported by Russia

MOSCOW, RUSSIA.—Russia has accomplished an extensive aeronautical program within the past six months. A dirigible has been completed, and various military maneuvers of a defensive nature have been practised.

Commercial activities include the establishment of regular daily passenger routes between this city and Berlin, between Leningrad, Riga, Reval, Koenigsberg and Berlin, and an occasional service for transporting mail, passengers, and gold between Irkutsk and Yakutsk. A service between this city and Tiflis is shortly to be opened.

Fox Shipment by Plane

IRKUTSK, SIBERIA. — Transportation of valuable animals captured in the frozen north across the Siberian wilderness to the railway is being accomplished here by airplane. A shipment of live blue foxes was recently brought to the government farm at Irkutsk via the air route from Yakutsk, in approximately 48 hrs.

Mexicans Improve Radio

MEXICO CITY, MEXICO—Reports here state that improvements have been made on the radio telephone and telegraph service which has been adopted by the Mexican Army Air Force.

New Load Mark Made by French

PARIS, FRANCE. — Success attended the first effort authorized by the reecntly formed French Air Ministry to set a new world record when two army aviators, Paillard and Camplan, flew a Bernard-Hispano plane at an average of 223 kilometers (approximately 138 m.p.h.) with a load of 2,000 kg. (about 4,400 lb.) over a 100 km. course (approximately 62 mi.) for a new load-carrying speed record, according to dispatches received here.

The previous record was held by Steindors, German aviator, and was approximately 134 m.p.h.

Dominion to Award Orders for 70 Planes

OTTAWA, CANADA.—The Canadian Government is prepared to place within the next few weeks orders for approximately 70 airplanes that will cost more than $400,000, according to an announcement by G. J. Desbarats, Deputy Minister of National Defense.

The new aircraft will be used by the Canadian Royal Air Forces and in civil government operations. The large number of planes needed is due to rapid extensions of flying activities as well as to the fact that much of the Dominion's flying equipment has become obsolete, Mr. Desbarats explained.

To Test Mail Service During Holiday Rush

OTTAWA, CANADA.—Contract for a three weeks, Winnipeg-Calgary air mail service during the Christmas rush season has been awarded to the Western Canada Airways by the Canadian Government as a test concerning the advisability of a permanent service between these two cities.

The contract goes into effect December 10 and lasts until the end of the month, thus fully covering the rush period.

Canadian Line Lowers Rates

ST. JOHN, NEW BRUNSWICK—Canadian Pacific Express announces reductions in air mail rates for the vicinity of Regina. The new rates schedule calls for a charge of $.10 per ounce with a maximum of $.40 per package, as compared with the former charge of $.50 per quarter pound and a minimum of $.50 per package.

Honolulu to Have Civil Air School

Edwin Lewis Buys Three Planes and Engages Pilots for Flying Service

HONOLULU, HAWAII—Edwin A. Lewis of the Lewis Tours Co., of Honolulu has brought three planes here and will found a civilian flying school.

Capt. James L. Giffin and Lieut. George A. Anderson, American aviators, have been engaged to conduct the school. They will operate the Swallow, American Eagle, and Monocoupe planes which Lewis purchased.

Lewis expects to place orders for each of these type planes for several private buyers during the next few months. He has also ordered a 10 place tri-engined Bach cabin plane with which he expects to inaugurate an inter-island passenger and mail line by Jan. 1, 1929.

Lewis believes that this service will especially appeal to his tourist customers. It will be augmented as rapidly as the business justifies.

Shanghai-Hankow Line To be Shortly Opened

SHANGHAI, CHINA—A fund approximating $1,000,000 is being raised to finance an organization intending to inaugurate a Shanghai-Hankow flying service as soon as possible. The commercial service will be under the direction of the Aviation Department of the Commander-in-Chief's headquarters, and the fund is being subscribed to by various commercial interests.

The project is being carried out in accordance with a decision reached at the National Aviation Conference at Nanking recently. By this same decision, it is understood that the inauguration of two other air lines linking Shanghai with Canton and Peking with Hankow will be attempted in the near future. The three special aeronautics districts of Shanghai, Hankow, and Canton are to be responsible for their respective share of the constructional work and operation of the services.

Borges Preparing for Flight

PARIS, FRANCE—Larre Borges, Uraguayan flier, is completing preparations here for a two-stop flight between Paris and Montevideo, Uraguay. Borges will be accompanied by a French air service officer.

K. L. M. Opening Service to Indies

To Operate Fokkers Monthly Between Holland and Batavia

AMSTERDAM, HOLLAND — Royal Dutch Air Lines (K.L.M.) now announces that in January it will inaugurate a regular monthly service over the 8,750 mi. air route to the Dutch East Indies.

The announcement follows experimental flights in which Fokker tri-engined planes carrying some 500 lb. of mail covered the distance in 12 days. This time effects a saving of about two weeks in the trip, which crosses the greater part of the two continents. A still greater reduction will be possible as soon as adequate equipment for night flying is provided.

The itinerary of the route will be: Amsterdam, Budapest, Constantinople, Bagdad, Bandar Abbas, Karachi, Allahabad, Calcutta, Rangoon, Bangkok, Medan, Palembang, and Batavia. Beyond Batavia, trips to Soerabaja, Balik Papan, Makasser and Timor Koepang are available. Also, the run between Medan and Batavia may be made with a stop at Singapore rather than Palembang, and flights may be made to Sabang from Medan, as well.

Short Flights for Graf

FRIEDRICHSHAFEN, GERMANY—Half a dozen short flights will be made in the immediate future in the Graf Zeppelin, according to an announcement explaining that these are test flights to comply with the requirements of the German Aeronautical Testing Station at Aldershof. A second trip to America will not be made this year, because the supply of fuel gas is reported to be at present insufficient.

Control of Civil Flying is Asked

LONDON, ENGLAND — A movement for unified control of civil flying in Great Britain has been put before the General Council of the Associated Light Airplane Clubs for consideration, according to the American Consulate-General, London.

The scheme provides for a central administrative organization which would take charge of all flying clubs, provide them with airplanes, engage instructors, and select airports. In addition, it would control some flying schools and passenger-carrying firms. The promoters hope the Government will lend its aid on some basis such as payment for each new pilot trained.

Travel Air in Melbourne Race

Showing an OX-5 Travel Air at the finish of the recent Aerial Derby held at Melbourne, Australia. The plane, owned by W. Raymond Garrett of that city, averaged 105 m.p.h. in the event.

R.A.A.F. Orders 28 Wapitis

BRISTOL, ENGLAND—The Royal Australian Air Force has placed an order for 28 Westland Wapiti airplanes fitted with Bristol Jupiter Series VIII geared engines. This is the first order of such magnitude to be placed by the Australian Government.

French Contemplate Mail Line to Santiago

SANTIAGO, CHILE—Testing the practicability of the establishment of a regular air mail route from Europe to Chile, Abola Mermoz, pilot for the French Latecore Co., landed here from Buenos Aires with the first consignment of European mail to be brought by air.

The contemplated service, which, it is understood, the French company hopes to inaugurate in May, would necessitate the construction of new hangars here.

There are no immediate prospects of a Chile-New York service but it is expected that Chilean Army planes will be available for service to the Peruvian frontier if Pan-American Airways, Inc., extends its service down the west coast as far as Peru.

Develops Supercharger

BERLIN, GERMANY—A new supercharger of the Roots blower type, suitable for use with any engine of from 600 hp. to 800 hp., has been developed by the Argus Motoren Gesellschaft of Germany. It is designed to maintain normal sea level induction pressures at heights of up to 6,000 meters (20,000 ft.).

The blower is supplied by the company complete with coupling and control gear. It will deliver 0.75 kg. (1.65 lb.) of air per second at a pressure of 380 millimeters (14.82 in.) of mercury. The weight of the complete blower is 45 kg. (99 lb.)

Junkers Announces A Supercharged L-55

BERLIN, GERMANY—Among the recent engines to be developed by European airplane manufacturers is the Supercharged Junkers L-55, a normal L-55 power plant fitted at the rear end with a gear-driven compressor.

The compressor rotor is driven at a speed of between six and seven times that of the crankshaft by use of plain spur gears and an hydraulic coupling or clutch. No details of this clutch are available but it is claimed that it serves not only to engage or disengage the supercharger, but to insulate the gears and the rotor against shocks resulting from variations in engine speed and also to vary the speed of the rotor.

Clutch Has Two Controls

The clutch is governed by two controls. One is operated by automatic pressure and the other by the pilot. This dual control arrangement makes it possible to put the supercharger in action and allows it to maintain normal induction pressure up to some height above 16,400 ft. Or the pilot may use it to give a temporary ground-boost such as for taking off, or other purposes.

In this engine the carburetor is between the compressor and the cylinders so that the compressor deals with air alone, and not with mixture. A special blow-back valve protects the compressor from back-fire through the carburetor.

Seeks Buenos Aires Base

BUENOS AIRES—Definite steps toward the establishment of the Seville-Buenos Aires airline are under way with the arrival here from Seville of Col. Emylio Herrara to inspect several locations suggested as suitable for an airport. Colonel Herrara was the official Spanish representative aboard the Graf Zeppelin on its westward flight.

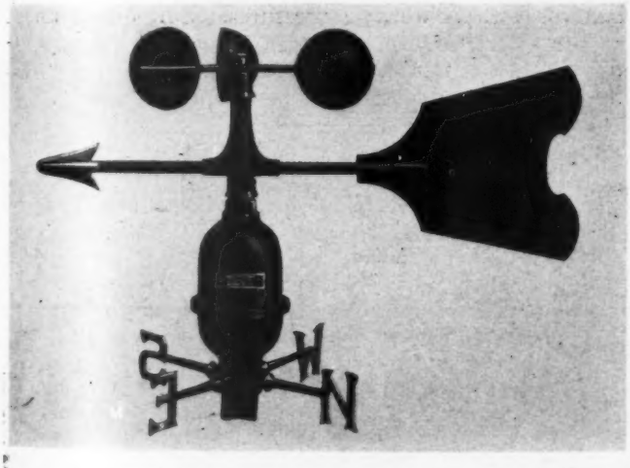
THE BUYER'S LOG BOOK

Friez Wind Tachometer

REMOTE READINGS of wind velocity may be obtained by the use of the wind tachometer developed by Julien P. Friez & Sons, Baltimore, Md. This device is included in the complete line of weather instruments manufactured by that company. The Friez wind tachometer consists of a three cup anemometer rotor coupled to the shaft of an electric tachometer which generates a current the voltage of which varies directly with the speed of the rotating cups. A specially calibrated voltmeter graduated in m.h.p., shows the actual variations in wind speed.

The three cup rotor is balanced and built strictly to the specifications of the U. S. Weather Bureau and ball bearings are used at both ends of the spindle. Both tachometer and voltmeter are manufactured by the Western Electric Instrument Co. A six volt current is generated at 1000 r.p.m., making the instrument reliable and increasing the factor of safety against loose connections, poor wiring or defective brushes. Many parts of generator and indicator are interchangeable.

Two types of wind tachometer now produced by the company. The No. 1201 is furnished with gilded direction letters and a wind vane to be used in cases where it



The No. 1201 *three cup wind tachometer developed by Julien P. Freiz & Sons.*

is desirable to observe wind direction as well as velocity. The No. 1200 is furnished without wind vane or direction letters. Both are designed to be mounted on a standard 1½ in. iron pipe or on a standard type of support, 8 ft. high, manufactured by the company. Two styles of dials or indicators also are available. One is equipped with long studs for use on a switchboard panel and the other with a metal back to hang on the wall. As many as twelve indicators can be supplied to operate on the same line and can be located as far as 12 mi. from the transmitter. Two No. 10 B. & S. gauge wires are required for connection between the transmitter with the indicators. Both indicators are graduated from 0 to 90 m.p.h.

The Friez wind tachometer requires no outside source of current since the entire system is energized by the force of the wind. It is therefore useful in isolated locations where no electric power is available.

Crouse-Hinds Beacon

ONE OF the most important airport lighting devices is the revolving beacon and, to meet the demand for this apparatus, the Type DCB24 has been developed by the Crouse-Hinds Company, Syracuse, N. Y. This beacon is of rugged construction and is designed in such a way as to require a minimum of attention. It does not require oiling more often than once in six months.

The Type DCB24 revolving beacon is equipped with a cast aluminum silicon non-corroding alloy barrel. All mechanism including motor, reduction gearing and contact rings, is mounted under the base and protected by a casing. The beacon can be equipped with any of the standard Department of Commerce code wheels for flashing the auxiliary course lights. It revolves approximately six times a minute. The barrel may be elevated or depressed in the trunnion arms as desired and a system of louvers is provided to cut off the spill light below the horizontal. The beacon revolves on radial thrust bearings immersed in oil and current is carried to it through brushes and slip rings.

Current from standard commercial lighting circuits may be used and the required voltage can be obtained by the use of a small transformer. Light sources include a 1000 watt, 110 volt lamp in T-20 bulb with monoplane filament; a 1000 watt, 32 volt lamp with T-20 bulb with monopane filament and a 1500 watt, 32 volt lamp with a T-24 bulb.

The beacon can be furnished with Zenith light panels in the housing. These consist of four prismatic glass strips mounted in the top half of the housing directly over the incandescent lamp. They are designed to concentrate the direct lamp rays into a narrow fan of light directed upwards. The purpose of this device is to enable the pilot to locate the beacon when he is above the main beam of the searchlight.

A 1/6 hp. motor is furnished for 110 volt D. C. or 60 cycle A. C. and motors for other voltages and frequencies can be supplied. Separate leads for motor, flasher and lamps are brought to a terminal block in the base. A hole for entrance of 1¼ in. conduits also is provided in the base.

The Crouse Hinds beacon has a front glass of 25 inch diameter and any one of several types of glasses may be used. The beacon is equipped with three way focusing mechanism and peep sights so that the lamp may be brought to the focal point of the reflector. A lamp changer, or device which automatically places a spare lamp in place after one has burned out, also can be supplied.

Mohair Interior Fabrics

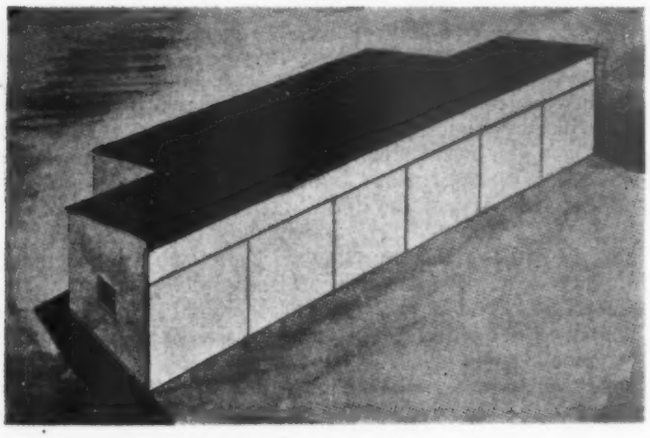
AFTER MANY years of experience in production of mohair fabrics for automobile upholstering, the Shelton Looms, 395 4th Ave., New York City, is now offering its products to the aeronautical industry. A number of mohair fabrics particularly adapted to use in finishing airplane cabin interiors are now produced by the company and samples will be sent to those interested on request.

The use of mohair fabrics for upholstering and trimming gives a luxurious appearance to cabin interiors and permits a choice and arrangement of harmonious coloring.

Kocher Hangars

A COMPLETE line of wooden hangars designed for various airport requirements is offered by the George T. Kocher Lumber Co., 226 S. Jackson St., Lima, O. These hangars are shipped knocked down and furnished with complete blueprints and instructions to erect. The company guarantees sufficient material including lumber, millwork, hardware, roofing and paint. Several standard models are stocked but special designs will be executed if desired.

The No. 104 or "Leader Special" is a one plane hangar, 36 ft. wide, 28 ft. deep and 14 ft. high of the "T" type,



A drawing of the No. 105 two-plane "T" type wooden hangar built by the George T. Kocher Lumber Co.

designed to house planes having spans up to 33 ft. A sound grade of yellow pine is used for framing lumber and this is covered with matched or tongued and grooved siding suitable for paint. Galvanized steel roofing is provided and doors are made to slide to the sides on an overhead track. A total clearance of 10 ft. in height is afforded. The front depth clearance is 19 ft., 8 in., and the depth of the tail compartment is 14 ft. The No. 105 is a two plane "T" type hangar similar to the Leader Special. In this hangar, an office and work room space is provided in the rear or tail compartment.

The Kocher No. 106 is designed for one or two planes and is rectangular in shape and has an arched roof. It is 40 ft. wide, 38 ft. deep and 18 ft., 6 in. high and space is provided for an office. Dimensions of the No. 107 one plane hangar are 36 ft. by 28 ft. by 14 ft. This model is a "T" shaped building, and like the others, has sliding doors.

Any desired capacity in excess of three planes can be obtained by using the No. 108 hangar and the units which may be added to it. The size of the three plane hangar is 128 ft. wide by 28 ft. deep. The inside dimensions are the same as those of the Leader Special and space for any number of planes may be obtained.

Johnson Tail Wheel

A PNEUMATIC tired tail wheel to replace the usual tail skid on airplanes has been developed by the Johnson Airplane & Supply Co., Dayton, O. This wheel can be mounted on a 5/8 in. diameter bolt, weighs 10¼ lb. complete and will support a load of 2,500 lb. It will support 500 lb. at 25 per cent. deflection of the tire.

The Johnson tail wheel is equipped with Timken bearings. It was developed in cooperation with the tire manufacturer and is fitted with 14 by 3 in. straight side tire with all weather tread.

Rome Trenchlay Cable

TRENCHLAY CABLE has been developed by the Rome Wire Company, Division of General Cable Corp., Rome, N. Y., to meet the demand for an underground cable impervious to the attack of moisture, earth acids and alkalines and other forms of distintegration; easy to handle and not subject to electrolytic corrosion, nor induced armor and sheath losses. It is being used for power distribution in a number of airports. Three types of cable for different uses are manufactured by the company. They are known as power, control and signal types.

A special corona resistant rubber compound has been developed for tube insulating the individual conductors in Trenchlay cable. Double faced rubberized cloth tape is tightly applied with a full one-quarter inch lap immediately over the rubber insulation in the power type. In the higher voltage forms this tape is applied before the rubber insulating sheath is vulcanized. An additional reinforcing sheet of dense cotton braid, saturated with special moisture repellent compounds, is applied over the individual conductors of the power type cable.

The asbestos base calk, which provides the homogeneous seal used throughout the entire structure of all types of Trenchlay is the result of long and intensive research. A heavy dense sheath of braided asbestos, impregnated with special moisture repellent compounds is employed where lead sheath is ordinarily used in underground cables. Tough, well impregnated fibrous tapes are employed for armor and heavy, full stranded jute is employed for the final or outer sheathing of all types.

Rome Trenchlay is made in many sizes and multiples and for various working pressures. Soft drawn tinned copper conductor, solid or stranded according to the use for which it is designed, is employed. A complete illustrated catalogue is issued by the company.

Anchor Wire Fences

AIRPORT OPERATORS thoughout the country are realizing the importance of providing sufficient protection for spectators and planes by providing adequate fencing for their fields. The Anchor Post Fence Co., Eastern Avenue and 35th St., Baltimore, Md., is now offering its products to companies constituting the aviation industry.

One of the boundaries of Miller Field, Staten Island, N. Y., showing Anchor chain link fence.

The company manufactures chain link fence, iron railings and gates. Among the airports now using Anchor fencing are Miller Field, Staten Island, N. Y., Logan Field, Baltimore, and the City of Detroit Airport. Anchor products are also used in enclosing industrial property.

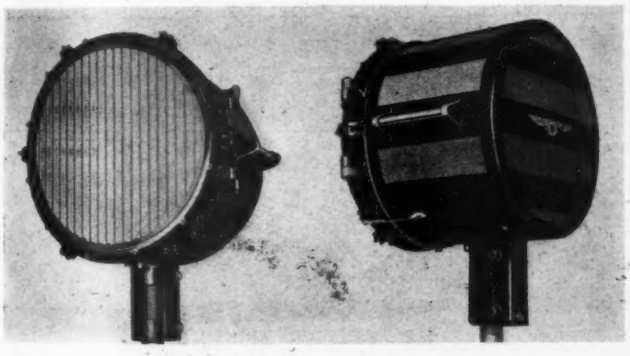
Chromilite Floodlight

THE CHROMILITE landing field floodlight, manufactured by the Westinghouse Electric and Manufacturing Co., South Bend, Ind., has been specially designed for use in the Westinghouse system of airport lighting. The design of this light permits mounting close to the ground and through the use of a multitple unit system, increased illumination can be obtained if the size of the field is increased.

The Chromilite floodlight consists of a weather resisting steel drum protected by several coats of paint and varnish, with provision for mounting on a 2½ in. pipe standard. The diameter of the drum is 25 in. and the depth 19 in. with overall dimensions of 30½ in. by 21 in. A 23 inch paraboloidal chromium plated reflector is provided and has such a focal length that a three degree beam divergence is obtained. All rays of direct light having an upward inclination exceeding 1½ deg. are intercepted by a system of louvers. Downward rays are not intercepted and serve to illuminate the ground in front of the unit. Rectilinear spread lenses can be supplied to fan out the beam horizontally to 20, 45, or 90 deg. The lamp socket is equipped with a three way focusing device.

Horizontal rotation and vertical tilting of 2 deg. above and 7 deg. below the horizontal are provided in the mounting and a high degree of accuracy in setting is possible.

Prong base sockets are regularly supplied for use with 1500 watt and 3000 watt 32 volt lamps. The style No. 349499 projector is equipped with a clear lens and a mogul screw socket for use with 115 volt projection or



Two views of the Chromolite landing field flood light manufactured by the Westinghouse company.

floodlight lamps. In addition the louvers have been omitted from this unit so that it may be used for long throw special floodlight or incandescent searchlight applications. Several other models, differing in lens equipment are manufactured. The net weight is 160 lb and the shipping weight 250 lb. A complete line of replacement parts also is stocked.

Reliance Adapters

INCLUDED IN the Reliance line of tachometer drive adapters manufactured by the Barbour Stockwell Co., 205 Broadway, Cambridge, Mass., are two models designed to drive two Model F series Reliance Tachometers off the same engine connection. These adapters are furnished either in solid brass, bronze or aluminum with S.A.E. or U.S. A.C.S. fittings.

The Model X-43 is a straight type dual adapter having a 1 to 3 increase ratio for use where the two drive cables are to lead in the same direction and the Model X-45 has the same ratio and other specifications but is suitable for installation where it is desirable for the cables to lead in different directions.

SIDE SLIPS

By ROBERT R. OSBORN

At a recent meeting of the National Academy of Sciences, there seemed to be considerable discussion about the location of the center of the universe, as all scientists apparently do not agree on this point. When this matter is settled and is out of the way, we have a little more difficult problem for them to tackle. According to our carefully made investigation there are some eight thousand cities claiming to be the "air centers" and "aviation capitals" of the United States. Possibly they could clear up this situation a bit by selecting an All-American team of "air capitals" for us.

* * *

After a year full of long distance flights which have been constantly postponed for one reason or another, it is pleasant to find an honest aviator who, according to H. L. C., made the announcement "Absolutely and positively, we make take off Friday."

* * *

According to the news from Los Angeles, airplanes flying over the studios have seriously interfered with the making of "Talkie" moving pictures. From the points of view of many people this is just another great use for the airplane, which makes it such a boon for humanity.

* * *

It seems to be always possible to overdo anything. For instance, C. E. H. reports that a friend of his had the mufflers removed from the engine in his plane because he came in after dark recently, and after circling the field for 20 min. without being able to attract any attention, had to land without field lights.

* * *

An editorial in a large New York evening newspaper had the heading, "An Aerial Marvel," and the following statements under that heading:

"The pilot rose from the landing field and discovered a 60 mi. gale in the upper air. He turned his plane to face the wind, throttled the engine down to a 60 mi. speed and, according to dispatches, remained well-nigh stationary for an hour. The force of the wind and the power of the engine balanced each other, and the pressure of the wind on the wings of the plane kept it afloat as though it were moving through the air. . . . The ability of the pilot to pit his engine against the wind and remain stationary for an hour strains the credulity."

If this editor would like to give his credulity not only a strain, but a real good workout some day, we'll take him out and show him a "Jenny" flying backward in a wind with the throttle wide open.

* * *

The Intrepid Aviator came in the office the other day with a very good scheme for speeding up the production of experimental airplanes, which we pass along to our readers. He says that the present generation of airplane designers are so optimistic by nature, that their designs almost always start with a 100 hp., which is replaced by a 200 hp. engine after the first flight test, or start with a 200, which is replaced with a 400. He proposes to issue engine information to all designers with the power ratings cut in half, and as they will then inadvertently use the correct size engine, the cost of the flight test and redesign will be saved.

The Wheels and Brakes *the Entire*

WACO

RYAN

Every important airplane manufacturer in the United States is using Bendix Wheels and Brakes.

This universal and unbiased endorsement classifies Bendix Wheels and Brakes as one of the most vital contributions ever made to the safe and efficient operation of airplanes.

Perfect streamline, light weight, unusual strength, precision workmanship, water-

VOUGHT

DOUGLAS

CURTISS

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CURTISS

TRAVEL AIR

Fully protected by patents and applications in U. S. and abroad

BENDIX

Endorsed by *Industry*

tightness, amazing efficiency—these Bendix features must obviously appeal to every thoughtful engineer. You have only to look at the manufacturers and users of Bendix Wheels and Brakes for unqualified endorsement!

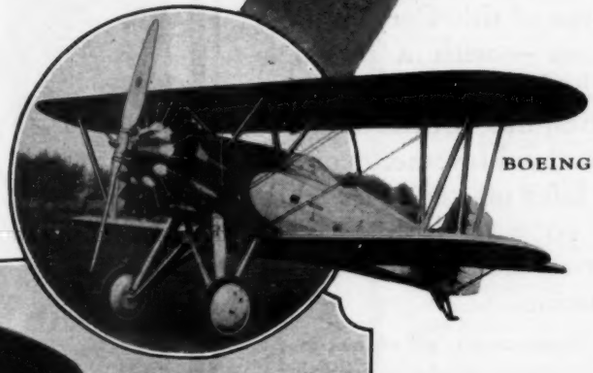
Bendix Wheels and Brakes are in regular production in all standard sizes

BENDIX BRAKE COMPANY
General Office and Plant, South Bend, Ind.
Division of Bendix Corporation, Chicago

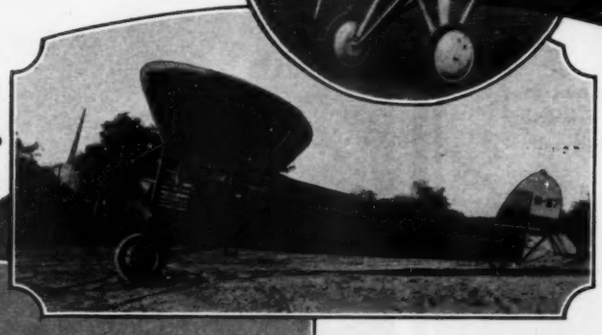
LAIRD

CONSOLIDATED

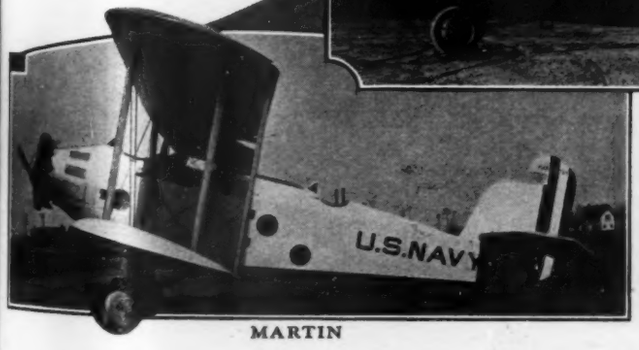
CURTISS



BOEING



FAIRCHILD



MARTIN

TOWLE

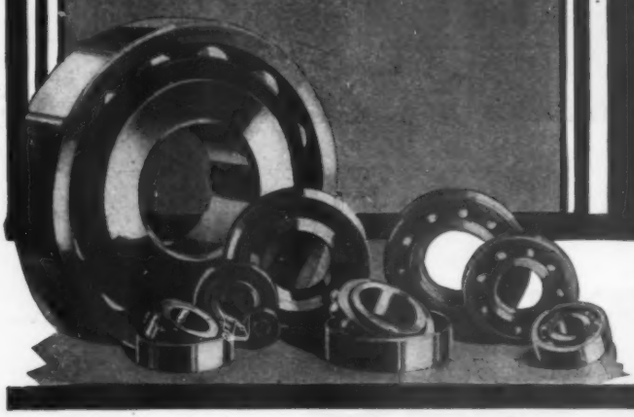
Bendix equipment on many more planes

BRAKES

THE NORMA-HOFFMANN BEARINGS CORPORATION takes this opportunity to pay its tribute of honor to Orville and Wilbur Wright —the world's first master-flyers.

In the development of the industry which these two founded, it has been the privilege of this Corporation to share — with a product which, by its dependable qualities, has contributed to the great achievements of all those later master-flyers who have so well upheld the honor of these two pioneers of aviation.

A welcome awaits all visitors to the International Aeronautical Exposition, at Booths A-2 and A-3.



NORMA-HOFFMANN
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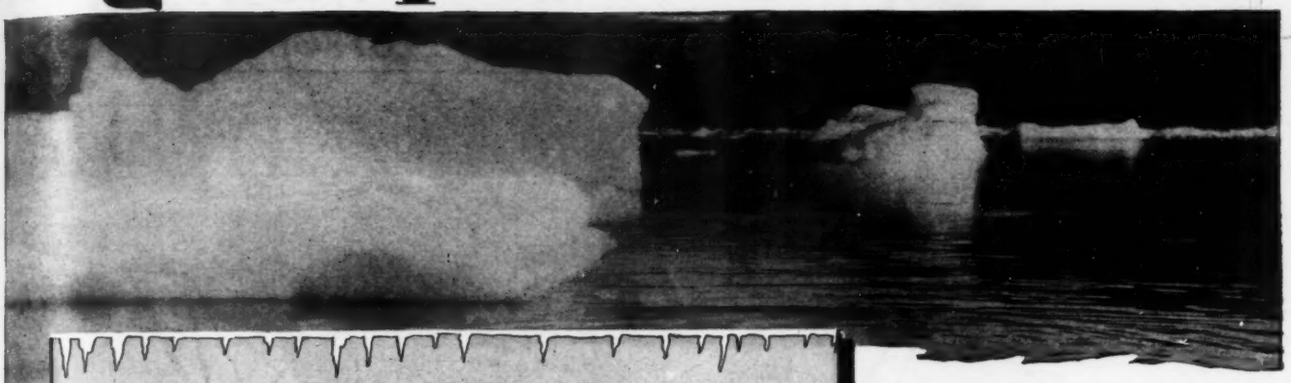
Stamford — Connecticut
PRECISION BALL, ROLLER AND THRUST BEARINGS

A good place to test oil



OTTO MELBYE, Chairman BERT HASSELL, Pilot

ROCKFORD TO STOCKHOLM
FLIGHT COMMITTEE

Rockford, Illinois

Kendall Refining Company,
Bradford, Pennsylvania,

Gentlemen:

After exhaustive tests during trial flights, most of which was at high altitudes in a round trip between Rockford and the Pacific coast, and in which Kendall " Penzbest " motor oil gave superior lubrication both at high and low temperatures, Parker D. Cramer and myself elected to use Kendall oil in the Wright Whirlwind motor of our Stinson Detroiter plane in our flight from Rockford to Greenland. The results more than justified our choice.

In the low temperatures met over Northern Canada and Davis Straits, and particularly in the extreme cold over the inland ice mass of Greenland, Kendall oil gave us perfect lubrication proving the low cold test of Kendall oil in practical operation.

Congratulating you on this most splendid product, I am yours very truly,

BRJH/KI

Bert R.J. Hassell

Greenland — where Bert Hassell and Parker Cramer proved the quality of Kendall Penzbest

"PERFECT LUBRICATION" on their notable flight from Rockford to Greenland, say Bert Hassell and Parker Cramer of Kendall Penzbest Oil. Not every pilot faces a trip to Greenland—something to be thankful for. But many of them will encounter mighty severe cold this winter right in home territory. They will need for their engines a lubricating oil that *won't* congeal the minute the motor is shut off—that *will* flow to every bearing and friction surface the instant the engine is started again.

The logical specification for severe weather conditions, is Kendall Penzbest Motor Oil. There you have an oil that will stand by you in freezing temperatures.... that circulates instantly and freely, with a minimum change in viscosity. Pistons are sealed. Moving parts protected. Repairs saved. Less strain on starter and battery. No necessity of draining and warming the oil at every stop. Better all round performance all winter.

Kendall Penzbest is derived exclusively from the Bradford (world's finest) grade of Pennsylvania Crude, of a purity so pronounced that no chemical treatment is used in the refining. Because it is *all oil,* free from impurities, Kendall Penzbest is slow to break down and gives longer service . . . the specified change period is thirty hours.

Winning pilots have expressed their faith in Kendall Penzbest in recent months by using it in such tests of speed and endurance as the National Air Tour, Transcontinental Air Derby and the Los Angeles to Cincinnati Airace.

Try Kendall Penzbest Oil this winter. Give it a real test. For a list of airports where Kendall Penzbest is now obtainable, address Aviation Division, Kendall Refining Company, Bradford, Pa.

KENDALL PENZBEST MOTOR OILS

International Aeronautical Exposition, Coliseum, Chicago, December 1st to 9th, 1928

KENDALL PENZBEST MOTOR OIL

REFINED FROM 100% BRADFORD GRADE OF PENNSYLVANIA CRUDE

THANK YOU *for mentioning* AVIATION

The "Bird" 3 Place Biplane

More Performance per Horsepower

View of Pilot's Cockpit

Performance Data With OX-5 at 1650 R.P.M.

High Speed	120 M.P.H.
Cruising Speed	100 M.P.H.
Landing Speed	35 M.P.H.
Take Off Run	100 Ft.
Climb at Sea Level	1,000 F.P.M.
Absolute Ceiling	20,000 Ft.
Gas Consumption at 100 M.P.H.	5 Gals. Hr.
Endurance at Cruising Speed	9 Hr.

Construction Features

Chrome Molybdenum construction throughout.
Minimum factor, 8 plus.
Quickly detachable stick and rudder in front cockpit.
Excellent Vision — wheels visible from pilot's cockpit.
Baggage compartment.
Panel instrument board.
Tunnel type radiator.
Adjustable stabilizer.
All ships wired for lights and airspeed.
Silent—oil and rubber shock absorbers.
5 gal. reserve fuel tank.

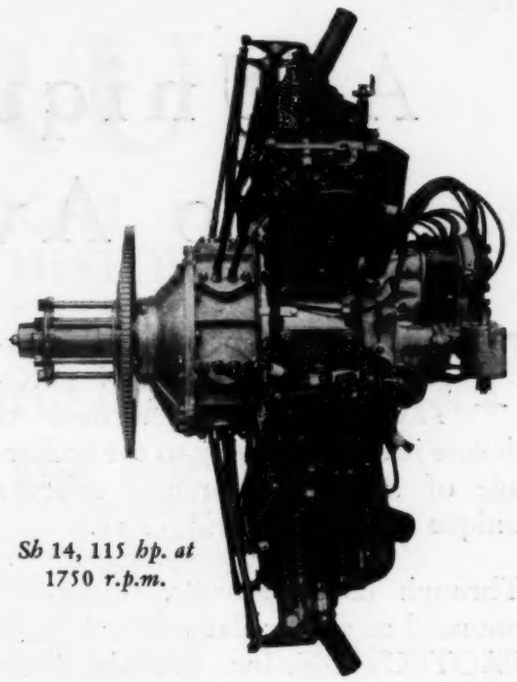
Dealers' franchises for this plane are still available in some territories.

BIRD

"Safety and Performance"

Brunner-Winkle Aircraft
CORPORATION
1-7 Haverkamp St., Glendale, Brooklyn, N. Y.

The New SIEMENS & HALSKE *Engines*



Sh 14, 115 *hp. at* 1750 *r.p.m.*

THE new Siemens five and seven cylinder aircraft engines will be on exhibit at the International Aeronautical Exposition in Chicago. Products of the internationally known Siemens & Halske engineering organization, these new engines developing 82 and 115 horsepower, promise to play an important part in the aircraft industry. Examine these power plants and look into their performance records and new features in engine design.

Also on display at the Chicago show will be models of other Siemens aircraft engines which now are standard equipment on many of the leading airplanes and lighter-than-air craft throughout the world.

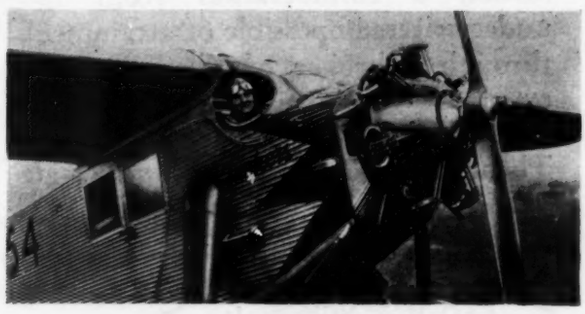
K. G. FRANK
CONSULTING ENGINEER

75 West Street, New York, N. Y.

General Representative of

Siemens & Halske A. G.

Bach Air Yacht—2 Siemens Sh 12 *Engines*



Junkers—Siemens Sh 5 *Engine*

Goodyear "Puritan"—2 Siemens Sh 10 *Engines*

Waco—Siemens Sh 12 *Engine*

A Unique Service to Aviation

THE announcement of this organization, AVIATION PROTECTION, Inc., formed to devote itself exclusively to the brokerage of aviation insurance, offers a unique service to the industry.

Through its *directorate,* to be announced at a later date, AVIATION PROTECTION, Inc., provides direct representation of all phases of the industry, including operating, manufacturing, airports, pilots, etc., to the underwriters. This representation means proper insurance at rates which should be progressively lower.

Through the *volume of its business* AVIATION PROTECTION, Inc., guarantees to each individual organization a consideration from the underwriters impossible of attainment through a broker of diversified interest.

Through its *organization and single purpose* AVIATION PROTECTION, Inc., offers a technical, engineering, loss and advisory service without equal.

By virtue of its *concentrated experience,* AVIATION PROTECTION, Inc., will make available to its clients from time to time such data as is beneficial to reduce rates, accidents, and insurance red-tape.

By virtue of the *situation* of its head office, in the heart of the Aviation insurance market, New York City, AVIATION PROTECTION, Inc., guarantees to its clients the lowest rates and most comprehensive cover available. We favor no one underwriting group. The service of this organization is devoted wholly to its clients, and insurance intrusted to us is placed to their best advantage.

We offer our service, the price of which is nothing, for your consideration and solicit your inquiry or suggestions.

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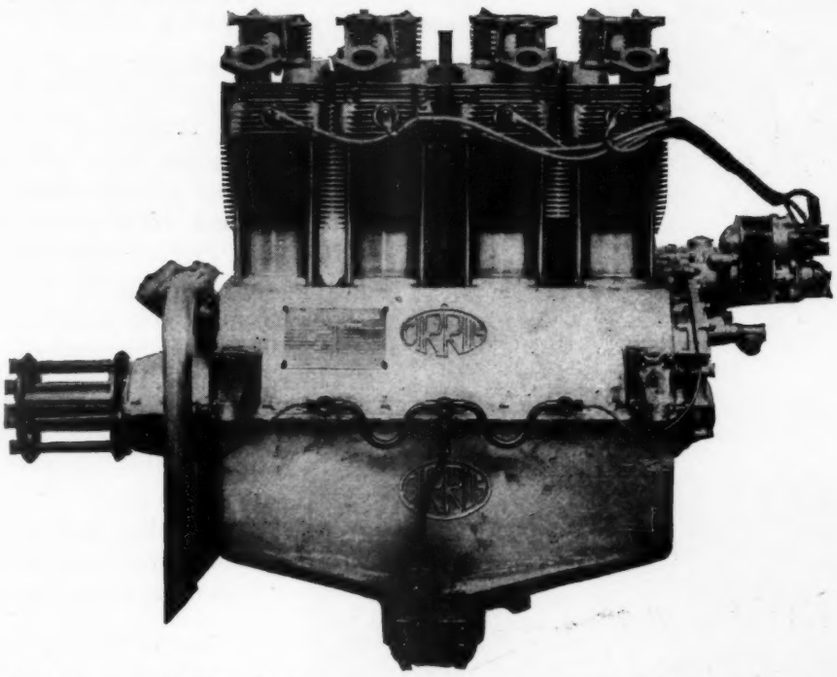
Our President will be at the Chicago Exposition. He may be reached through Air Associates, Inc.

CIRRUS

THE WORLD FAMOUS LIGHT PLANE ENGINE WITH A RECORD OF HISTORIC FLIGHTS IN EVERY COUNTRY

To Become an American Product



Some of the remarkable flights made by the Cirrus Light Plane Engine are:

* Longest Solo Flight, England to Australia, 12,000 miles, in 15½ days.
* Longest Solo Flight by a Woman Pilot, Lady Heath's Flight from Cape Town to London, 8,000 miles.
* Longest Non-Stop Flight for Light Plane, London to Riga, 1,200 miles.
* Longest Flight by a Light Plane, England to Australia and Tasmania, 17,400 miles, Capt. W. N. Lancaster and Mrs. Keith Miller, co-pilots.
* World's Altitude Record for Light Plane, over 18,000 ft., Lady Heath, the pilot.
* 1st Prize The King's Cup Air Race 1926 } the most important aerial event
* 1st Prize The King's Cup Air Race 1927 } in the British Empire.

The American-built Cirrus (Mark III) 4 cylinder in-line engine of 95 h.p. fills a definite need in American aviation. Its simplicity and well establishd reliability and low head resistance make it the ideal power plant for training planes, 2 and 3 seater sporting, and commercial planes.

It will be manufactured under expert American and British supervision.

For further information write

AMERICAN CIRRUS ENGINES INC. 84 William Street, New York City

See Cirrus Engine on display at International Aeronautical Exposition at Chicago, December 1st to 9th, 1928.

Ten years ago the first commercial airplane factory in America began production in Wichita. Like all pioneering efforts, this infant industry struggled for years, for its very existence.

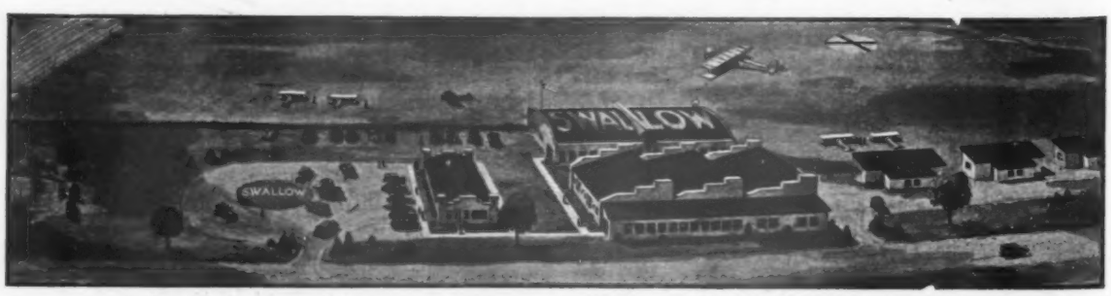
From this small beginning, however, has grown Wichita's present dominating position in the industry. The past year's growth has been stupendous. From approximately 100 employees, producing some 300 planes in 1927, to 841 employees at the present time, and an estimated production of some 1,500 planes, with a value of nearly $8,000,000 in 1928,—nearly one-fourth of all the commercial airplanes made in America this year will come from Wichita's factories. The whole world is Wichita's airplane market. Over nearly every civilized country, Wichita-made planes are now flying.

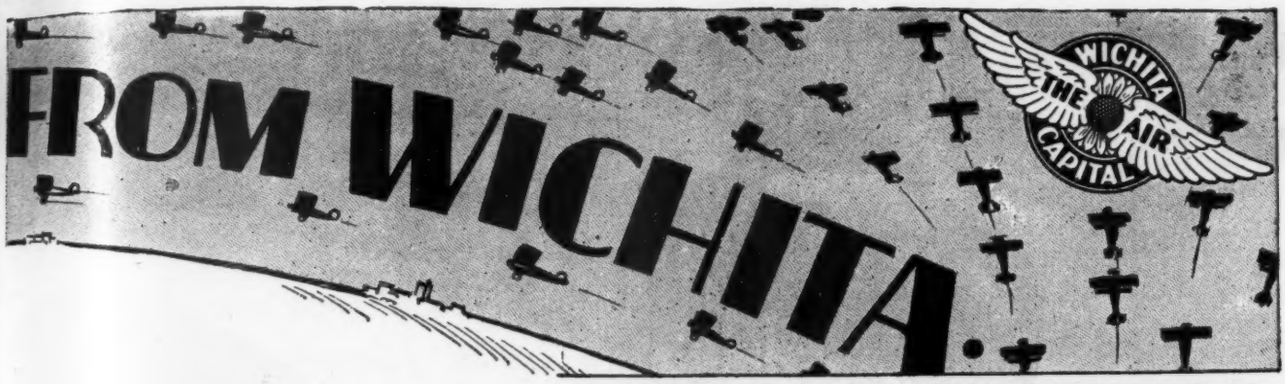
To men who have a vision of the marvelous future of this business, Wichita has much to offer. Our many factories require vast amounts of material, steel tubing, dope, airplane linen, accessories and parts of all kinds—and, of course, most important of all, MOTORS.

We invite inquiry from responsible men, planning to enter any phase of the aircraft industry. Full details will be sent upon request.

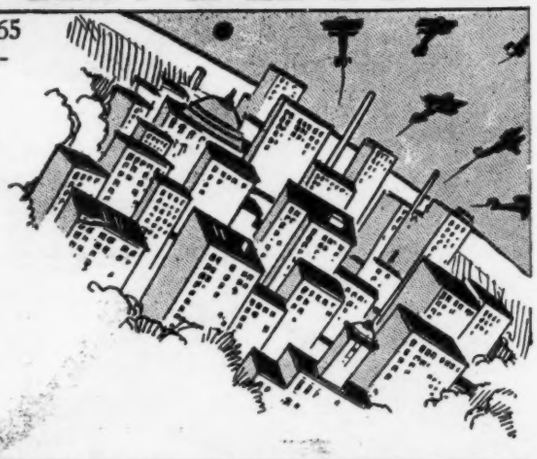
Chamber of

WICHITA,





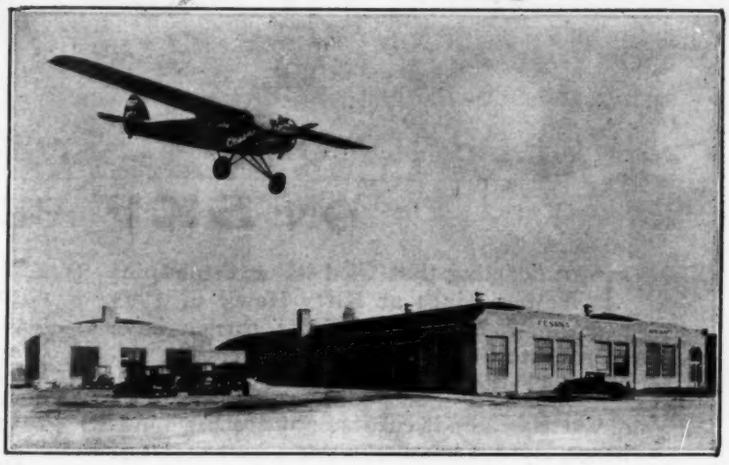
THE AIR CAPITAL



Wichita's climate is ideal, with no fogs and real flying weather 365 days of the year. The vast Kansas plains are one unending landing field for a hundred miles or more in every direction.

All Wichita is air-minded. This is evidenced by the recent addition to the curriculum of Wichita University, of a Chair of Aeronautics, offering one of the most complete courses of study to be found in any of America's Higher Schools of learning. Wichita also has seven other schools of aviation, one National Air-Mail Line, and one Passenger and Express Air-Transport Line. Other products affiliated with the industry, manufactured and marketed nationally from Wichita are:

Flying Suits, Shock Absorbers, Radiators, Propellers, Motors, Airplane Batteries, Brass and Aluminum Castings, Propellers, Spark Plugs, Puttees, Leggings and Boots, Airplane Sirens, Hangars, Gas Tanks, Welding Equipment, Airplane Gasoline, as well as one of the largest jobbers of Aircraft Steel in the country.



Wichita's Airplane Manufacturers, all in active production at the present time, include:

TRAVEL AIR MANUFACTURING CO.
SWALLOW AIRPLANE CO.
STEARMAN AIRPLANE CO.
CESSNA AIRCRAFT CO.
SWIFT AIRPLANE CO.

Commerce

KANSAS

DEPENDABILITY RIDES THE HEAVENS

ON SKF BEARINGS

THE fledgling that tried its uncertain pin-feather wings at Kitty-Hawk in 1903 now soars. The wings of the ostrich have grown into the pinions of the eagle. The airplane is here to stay!

Curtis helped it cut its baby teeth. Lindbergh, Byrd, Chamberlin and a few others not only helped it out of its teens, but convinced a doubting, half-fearful world that air transportation was here—that, at last, *dependability rides the heavens.*

SKF Industries, Inc., has contributed nothing to the progress of aviation but the highest type of anti-friction bearings SKF laboratories could produce. They rode with Lindbergh to Paris—with Chamberlin to Germany—with Byrd to Ver-Sur-Mer—with Maitland and Hegenberger to Honolulu.

But in these accomplishments there is the pride that comes from making even the most inconspicuous of products so much better than any one has made it before that men whose lives *depend* upon it, *select* it.

SKF INDUSTRIES, Inc., 40 East 34th St., New York City

Visit the
SKF
EXHIBIT *at the*
INTERNATIONAL
AERONAUTICAL
EXPOSITION
Chicago
Dec. 1st to 9th
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SKF

Nothing is apt to cost so much as a bearing that cost so little

Ball Bearings — SKF Puts the Right Bearing in the Right Place — Roller Bearings

1884-S

Aerol Struts and Your 1929 Business

THE shifting of aircraft purchases to larger and more qualified operators who insist on the best equipment available, is making it easier and almost necessary that manufacturers offer every proven refinement as standard equipment on their ships.

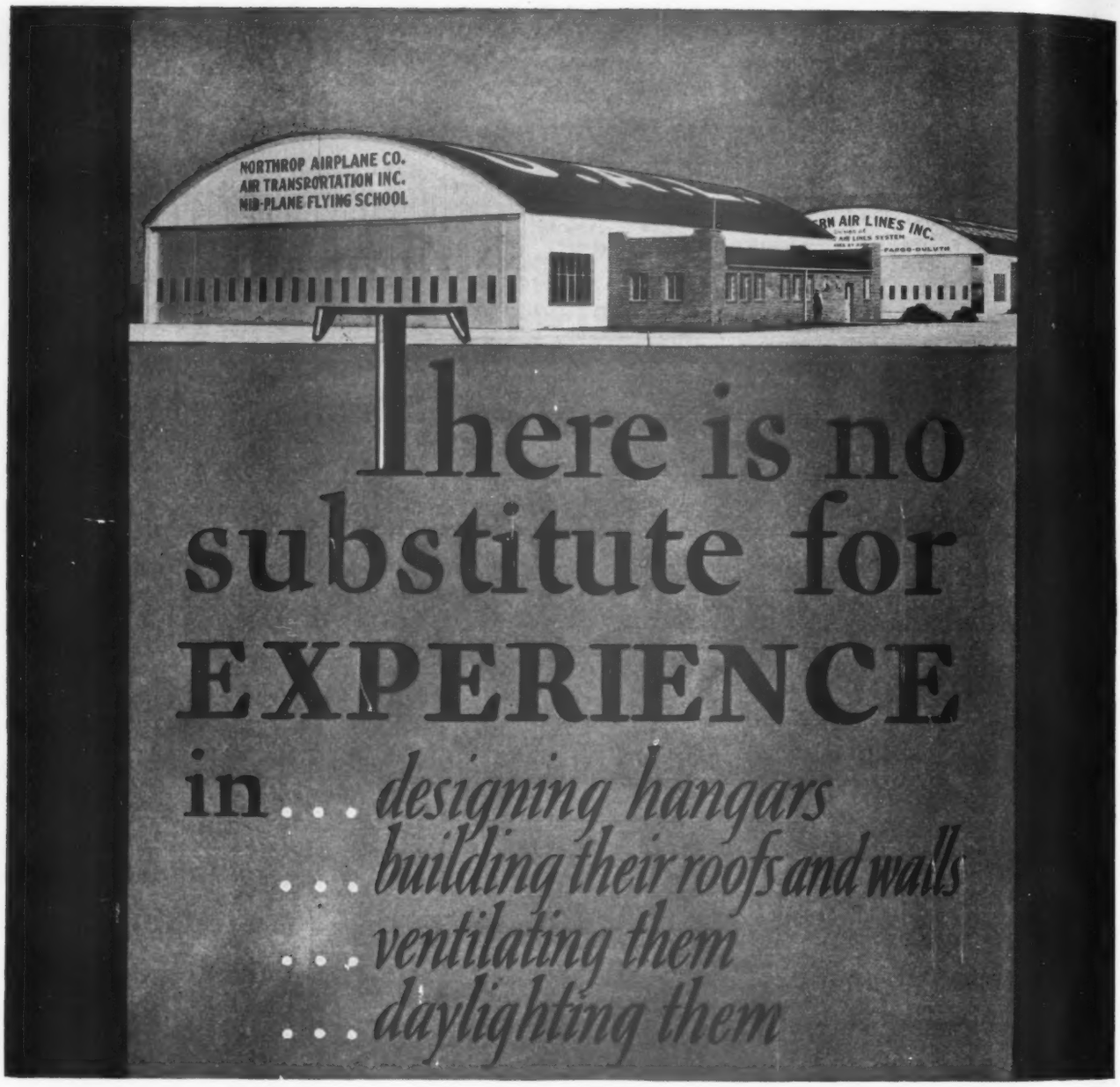
It naturally follows that any product that so effectively contributes landing safety, comfort, economy and general performance as does the Aerol Shock Absorbing Landing Strut, is in a position to materially aid manufacturers to successfully compete in the 1929 market.

Aerol Struts, employing the oleo-pneumatic principle, are unrivaled by other shock-absorbing devices. These struts can be incorporated into your design landing gear. The cooperation of our Engineering Department is available to manufacturers at any time.

THE CLEVELAND PNEUMATIC TOOL COMPANY

3737 East 78th Street, Cleveland, Ohio

Also manufacturers of Cleco-Gruss and Cleco-Westinghouse Air Springs for buses, trucks and automobiles.


NORTHROP AIRPLANE CO.
AIR TRANSPORTATION INC.
MID-PLANE FLYING SCHOOL
There is no substitute for EXPERIENCE
in . . . designing hangars
. . . building their roofs and walls
. . . ventilating them
. . . daylighting them

THIS vast young business of airport building has brought up whole new sets of problems in building construction. Totally different from the old problems. New conditions to meet. New and unexpected obstacles to overcome. Problems that no man can possibly foresee until he has actually met them. Nothing can help you but experience. And it is all so new that very few organizations have had a chance to get the experience.

But Robertson has the experience.

The H. H. Robertson Company has been helping build hangars since away back before the birth of modern commercial aviation. It has been at it all these intervening years . . . in America, England, Spain, India, Greece, Chile, Panama, Hawaii, the Philippines . . . all over the world.

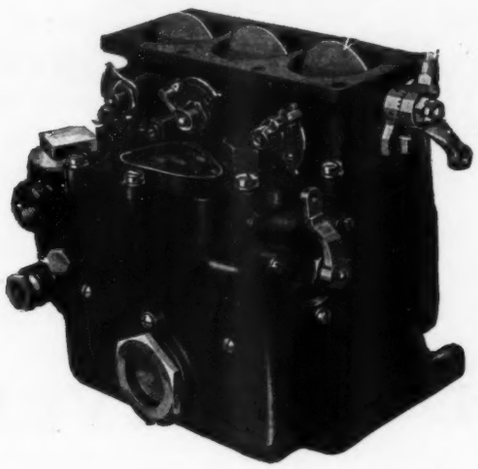
Robertson's today is headquarters for airport information. Bring your problems to Robertson engineers. They will give you their advice and suggestions without cost and without obligation to you.

H. H. ROBERTSON COMPANY · PITTSBURGH

ROBERTSON

Has the Experience

Assurance of Perfect Performance



STROMBERG
AIRCRAFT CARBURETORS

It is significant of the wonderful performance of Stromberg Aircraft Carburetors that they have been adapted as standard equipment on leading aeroplane engines, which have done so much in making possible the world's most sensational, history-making flights.

Can any selection bespeak greater endorsement, or give such conclusive evidence of dependable, durable and economical service?

We invite you to take advantage of the efficient co-operation offered by our engineering department for further and complete information.

STROMBERG MOTOR DEVICES CO.
58-68 East 25th Street, Chicago, Ill.

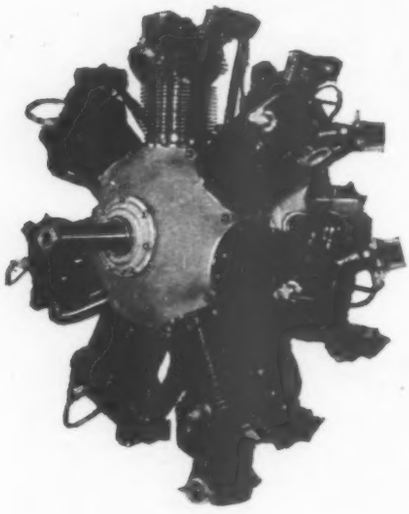
History-Making Flights

Lindbergh
Byrd
Chamberlin
Wilkins
Stinson
Goebel
and others.

Standard Equipment on

U. S. Army
U. S. Navy
U. S. Marine Corps
Aircraft Engine Co.
Allison Engineering Co.
Axleson Machine Co.
Curtis Aeroplane & Motor Co.
Fairchild Caminez Engine Co.
Kinner Aeroplane & Motor Co.
Packard Motor Car Co.
Pratt & Whitney Aircraft Co.
Warner Aircraft Co.
Wright Aeronautical Corp.

Scarab



THE
WARNER
SCARAB

110 H. P.
1850 R. P. M.

Warner Achievements!

IN less than six months from the time the first "Scarab" engine was produced, the engine has proven itself in the following competitive events:

1. The capture of third place in the National Air Tour, leading all single motor cabin planes, which was accomplished by a Stinson Junior equipped with a Warner "Scarab."
2. Winning of 1st, 2nd, 3rd, and 4th places in the New York-Los Angeles Class "A" Air Derby by Cessna, American Moth, Travel Air, and the Challenger—all equipped with the Warner "Scarab."
3. Taking 1st, 2nd, and 3rd places in the Class "A" Cincinnati Air Derby by American Moth, Stinson, and the Challenger—also all equipped with the Warner "Scarab."

Such phenomenal results could only be accomplished by an engine built by an experienced, careful engine building organization guided by experienced leaders in the financial and manufacturing world.

The 1929 series "Scarab" retains all of the qualities of the original engine and has in addition a number of refinements and improvements which add to the performance and reliability, and reduces servicing to a minimum.

THE WARNER AIRCRAFT CORPORATION
Detroit-Michigan
U. S. A.

SEE EXHIBIT AT CHICAGO SHOW

Aluminum Fuel Tanks and Dural Products

Nicholas J. Streloff announces the formation of the STRELOFF-NAUGHTON CORPORATION, and the opening of a fully equipped factory for the manufacture of welded aluminum fuel and oil tanks and other duralumin products used in aircraft construction.

For fourteen years Mr. Streloff has been identified with the aircraft industry, specializing in welded aluminum products and is known to the industry for his work in connection with the building of aluminum fuel and oil tanks.

The new plant of the STRELOFF-NAUGHTON CORPORATION, occupying 7,500 feet of floor space and equipped with modern machinery, is in a position to render efficient, prompt, and economical service to the aircraft manufacturers. The facilities of the company permit quantity production to a point where the price standard will be attractive to manufacturers of all types of commercial planes.

THE STRELOFF-NAUGHTON CORPORATION invites inquiries for quotations on all types of welded aluminum fuel and oil tanks, cowlings and special aluminum parts. All factory work is under the direct supervision of Mr. Streloff.

Welded aluminum products of the company will be exhibited at the International Aeronautical Exposition in Chicago and an invitation is extended to all manufacturers to visit booth 619 in the Coliseum.

Streloff-Naughton Corporation

50 William Street, Long Island City, New York

Telephone: Hunters Point 10463

VISIT BOOTH No. 619 COLISEUM

T. A. T. FLYING

A Subsidiary of TEXAS AIR

NEW discoveries, new inventions and modes of living have led into new occupations and professions. The new profession arises out of the wonderful scientific and mechanical advancement that universally affects the changing world of the twentieth century. The man who knows flying finds himself at the forefront. It is a field where opportunities multiply, where new and stimulating developments are of daily occurrence, and where there is still the romance of a new conquest of the world.

Since the beginning of the year airway mileage operated under contracts awarded to transport companies as the basis for the development of regular commercial air transport systems has about doubled, increasing from about 7,000 miles operated in January to nearly 13,000 miles in September.

The manner in which the public, and especially business interests, have been quick to avail themselves of this rapid system of transportation in its extension to almost every important center in the United States, is evidenced by the increase of mail cargoes, which have more than doubled, increasing from 144,000 pounds in January to approximately 424,000 pounds carried in September.

It is interesting to note that on the Twenty-Fifth Anniversary of the first airplane flight, there were 18,459 miles of airways operating. This is more than double the number of miles of railroads, 9,021, which were in operation on the Twenty-Fifth Anniversary of the railroad in 1850.

The coming of the locomotive and the automobile each in its turn actually revolutionized civilization, and it is not unreasonable to believe that the great progress of aviation will equally affect the modes and habits of our daily life. The use of the Airplane must inevitably increase. Great business enterprises will be built around it and numerous related industries associated with it.

In choosing your school for training in the art of flying, you should use the greatest care. Flying is an art and a profession, and aviation should be entered only with that in mind; it is not something that can be grasped in a short time.

Colonel Charles A. Lindbergh, in speaking of training, has the following to say: "The training of commercial pilots is the most important part in air operation. Most pilots have, until the present, received their training in military schools, but the present demand is exceeding the supply. As a result, numerous commercial schools have been started and many of these leave much to be desired. They are not well organized and emphasize the low cost rather than the quality of their institution."

The T. A. T. school has been planned with only one purpose in mind—proper and thorough training. Every phase of the instruction has an expert in charge and has only the best equipment to use. All pilots are licensed by the Department of Commerce as transport pilots and are approved Air Mail pilots. All planes are licensed aircraft.

All Instruction Under Personal Supervision

SCHOOL, INC.

TRANSPORT, Inc., Ft. Worth

Actual Flying instructions are given by means of dual controls in New Production Airplanes by U. S. Department of Commerce licensed Air Mail pilots, and you take the stick in your hand from the start, rate of progress varies with the individuals, but most students are ready to solo after eight to ten hours dual instruction.

The T. A. T. ground courses includes instruction in Aeronautical Nomenclature, elementary Aero Dynamics, principles of aircraft design, construction and maintenance of aircraft and aircraft engines, aerial navigation, meteorology, radio theory and practice, air commerce regulations and traffic rules.

A third element of the course is found in the opportunities given you to observe the complete maintenance of aircraft as well as their care and overhaul. Attached to our hangars are well equipped shops where our mail planes are kept in condition for the carrying on of the air mail operations of this company and many other flying activities conducted by us.

Finally, in your association with T. A. T. air mail pilots, instructors and craftsmen and your contact with the varied activities of the field, you will absorb much that is not directly a part of the course of instruction but which is vital to your success as a pilot. As T. A. T. is contractor to the Postal Department in operation of the two Texas air mail lines between North and South Texas, you will hear of unique and interesting experiences, you will learn to analyze the causes of success and failure and you will be placed in contact with an actual operation of over 1,300 miles daily of scheduled flying.

Each T. A. T. Student is licensed as a student pilot by the U. S. Department of Commerce. This requires that the student pass an examination by a licensed physical examiner.

The T. A. T. Flying School is also one of the few schools in the South recognized and endorsed by the U. S. Department of Commerce.

You will not be a finished pilot when you complete any one of our courses but you are just that much nearer one than you were at the time you started. After you have finished fifty hours of solo flying and have passed your Department of Commerce examination and test you are in a position to earn your way from there on.

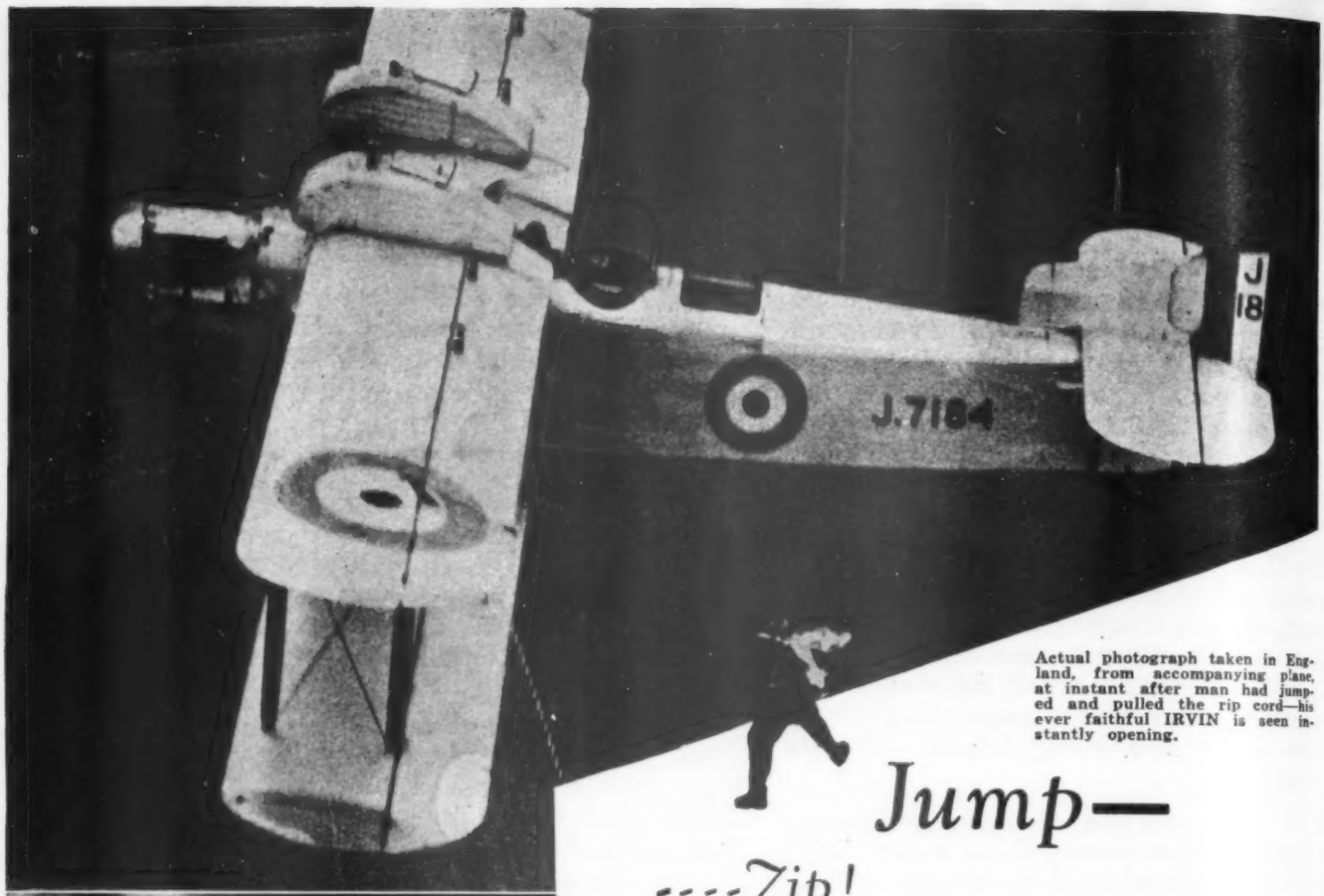
We do not believe that there is any other field open to a young man that offers him the opportunities for rapid advancement and big pay that aviation offers.

The recent growth of aviation has created more flying positions than there are competent pilots to fill. Opportunity is presenting itself today to every able-bodied young man.

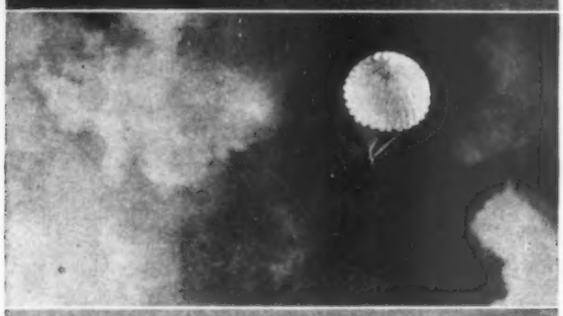
The T. A. T. is in a position to help you prepare yourself for these positions and all communications will receive our very prompt attention.

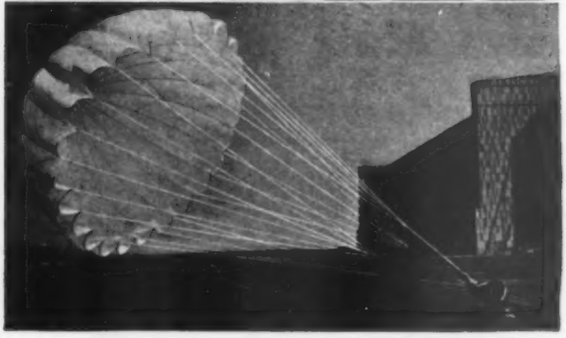
T. A. T. FLYING SCHOOL, INC.
Fort Worth, Texas

of United States Transport Air Mail Pilots



Actual photograph taken in England, from accompanying plane, at instant after man had jumped and pulled the rip cord—his ever faithful IRVIN is seen instantly opening.





Jump—

----Zip!

IT'S OPEN. Glory be—you're safe! Your fall stops. You rest in mid air. And then relax. While Mother Earth floats ever so gently up to greet you.

For so it seems as you glide smoothly, easily ground-ward, sharing the long-proven confidence of certain safety that IRVIN Air Chutes have bred all over the world, in the minds of men who fly—and sometimes jump.

Scores and scores know what a life saver this is, from their own far-flung experiences in the air.

Already more than 150 aviators have been saved to life and service by use of their "IRVIN Air Chutes when naught else could possibly have brought them safely down.

Among these are aviators in the Air Forces of Great Britain, Japan, Sweden, Denmark, Poland and the Argentine Republic, as well as scores in the United States.

A number indeed have been saved in commercial operations.

Many of the emergencies were of the most extreme nature, and in every case the IRVIN Air Chute functioned perfectly.

After thorough investigation and rigid comparative tests, many Governments have adopted the IRVIN Air Chute as the standard life-saving equipment for their Air Forces.

If extreme emergency—all unannounced as it usually comes—suddenly confronts you in the air, will you, too, be ready to meet it with IRVIN confidence?

Do you know what this means?

Write today for illustrated pamphlet "For Safety in the Air, Everywhere".

AIR CHUTES
IRVIN

Irving Air Chute Co., Inc.

Cable Address: "Irvin, Buffalo, New York, U. S. A."

Head Office, 372 Pearl St., Buffalo, N. Y., U. S. A.

AN ANNOUNCEMENT

AS THE YEAR CLOSES, *the eyes of many nations...far-seeing eyes of progressive people in all parts of the civilized world ...will come to rest on the greatest aeronautical exposition in the history of flying*

THE INTERNATIONAL AERONAUTICAL EXPOSITION

IN THE COLISEUM AT CHICAGO

DECEMBER 1 TO 9

INTERNATIONAL in scope, it is all-inclusive. Made possible by the splendid engineering talent of this and of all other nations, and by the noblest sacrifice that mortal man ever can make... the gift of human life in the interest of progress.

It is our privilege to assist in a small way in this splendid undertaking, and to show to modern flying the first gift of our own engineers... THE COMET RADIAL MOTOR [approved].

To the end that we may keep faith with the pioneers who have gone before us, and that we may merit honestly the confidence of those who remain to engineer ships of the future, we pledge ourselves to build to a single standard... the only standard... *finally*, by which tools of the air deserve to survive... the standard of *Reliability in Flight!*

Sincerely,

W. E. Wilson.

President
The Aircraft Engine Corporation

NUMBER 1709 EAST TWELFTH STREET ~ OAKLAND, CALIFORNIA

Distributor

Franchise Applications

DATA

Models in Production

Three place open. Four place cabin.

Power Units

Designed for installation of J-5 AB Wright Whirlwind, 200 H.P. motor. Other power units may be installed.

Loading

Normal pay load, two passenger and baggage, 400 to 500 lbs. Gross wt. 2650 lbs. Power loading (J-5 AB) 13.25 lbs. per H.P. Wing loading 8.06 lbs. per sq. ft.

Dimensions

Wing span—upper 34', lower 30'. Total wing area 310'. Overall length 24'6". Maximum height 10'. Wheel tread 7'6".

Performance Data

(*Conservative with full load*)

Maximum speed 130 M.P.H. Landing speed 42 M.P.H. Rate of climb at sea level 1400 feet. Cruising speed 1600 R.P.M. 110 M.P.H.

Fuel Data

Gasoline capacity upper wing 40 gal., fuselage 30 gal., total 70 gal. Gravity feed through ½-inch lines. Oil capacity 8 gal.

Instruments

Magnetic compass, air speed indicator, oil pressure gauge, temperature gauge, altimeter, switch—all conveniently arranged on a durable panel. Fire extinguisher and first aid kit. Gasoline strainer and fuel control located conveniently in Pilot's cockpit.

NOW BEING RECEIVED

TERRITORY assignments to distributors are now being made. Applications are being accepted with a view of acquiring the most aggressive, reputable and permanent representation in each territory.

The trend of the industry toward a wider use of metal in aircraft construction places this organization in an unparalleled position. The parent company (Butler Manufacturing Company) possesses a background of nearly 30 years experience in the fabrication of metal and steel products for world wide trade. Its enormous, modern facilities are especially well adapted, not only for the manufacture of aircraft, but for aircraft accessories as well. Its facilities, its engineering talent and its resources bespeak leadership and permanency.

The Butler Aircraft Corporation has been formed for the better concentration of outstanding skill in the design and construction of Butler Aircraft and aircraft accessories and to function as the selling organization.

BUTLER AIRCRAFT

BUTLER AIRCRAFT CORPORATION

13th and Eastern Ave., Kansas City, Mo.

THANK YOU *for mentioning* AVIATION

Announcing

AIR TRAINER
MONOPLANES

Price $2,875. Flyaway Our Field, Lansing, Mich.

NOW! The utmost value, performance and safety in training aircraft. The strongest, safest and easiest-flying training plane built. Parasol type. The only low-powered training plane made. Built from materials used by U. S. Dept. of Commerce and to its specifications. Split axle type landing gear.

This plane is the result of years of experimental and research work, both in this country and abroad. Operating cost only 2 cents a mile, it opertaes at 50% less cost than the average training plane. Unusual visibility because of high-winged construction.

See it—fly it—and you'll buy none other. On display at the International Aeronautical Show, Chicago, Dec. 1-9.

Applications for Distributing Dealers' Territories are now being considered. Write for literature and data. A protective, protfiable franchise—100% guaranteed.

Specifications

Span, 34 ft.
Chord, 5'8"
Wing Section, Clark Y, 190 sq. ft.
Aileron Area, 12 sq. ft.
Elevator Area, 8 sq. ft.
Fin Area, 3½ sq. ft.
Rudder Area, 7½ sq. ft.
Length Over All, 24 ft.
Height, 7'8"
Weight (empty), 800 lbs.
Useful Load, 475 lbs.
Full Load, 1275 lbs.
Dihedral, 1½°
Load,•6 lbs. per sq. ft.
Load, 18 lbs. per H.P.

Performance

High Speed, 100 miles per hour
Cruising Speed, 85 miles per hour
Landing Speed, 35 miles per hour
Cruising Radius, 400 miles
Take-off Run, 200 ft.
Climb at Sea Level, 800 ft. per minute
Ceiling, 18,000 ft.
Gas Consumption at Cruising Speed, 4½ gals. per hour
Oil Consumption, 1 pt.

Power Plant

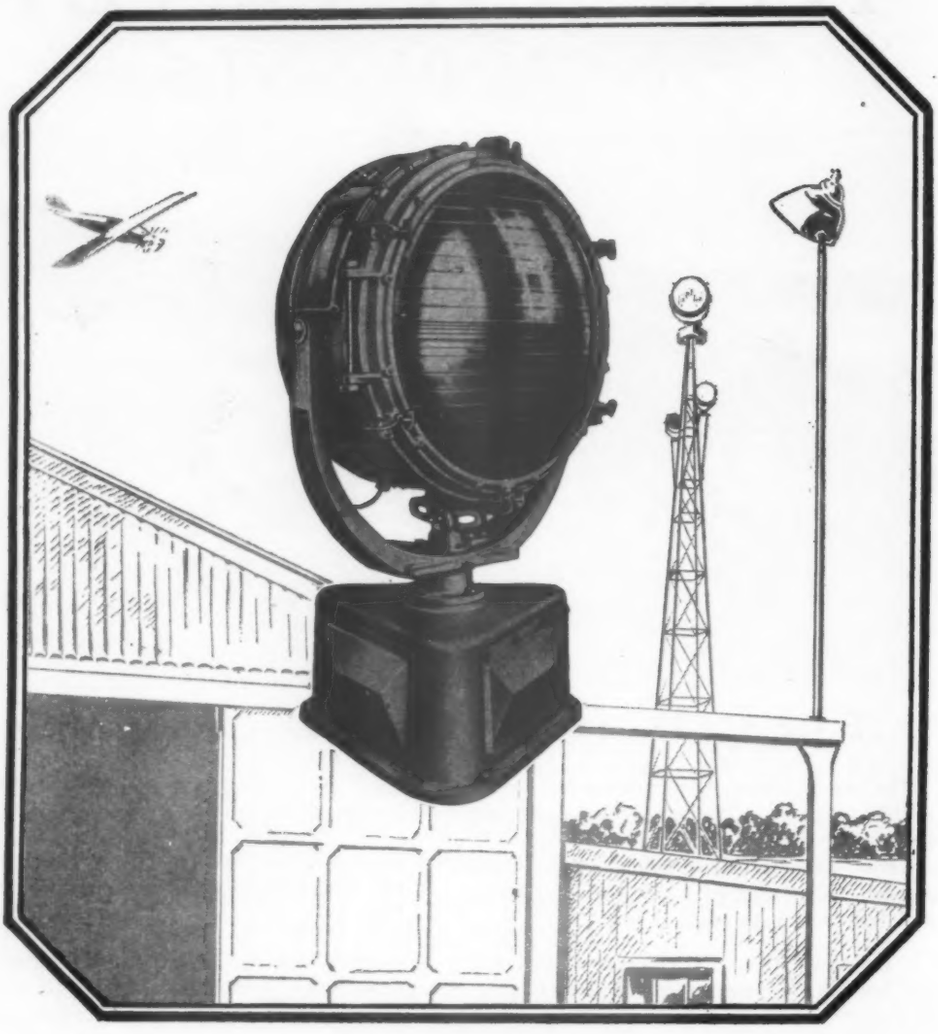
Engine, Le Blond
H.P., 60
Reserve H.P., 15
Gas Capacity, 20 gals.
Oil Capacity, 2 gals.

Equipment: To U. S. Dept. of Commerce Specifications

CAPITAL AIRCRAFT CORP.
Manufacturers

LANSING MICHIGAN, U. S. A.

A NEW 24-INCH
REVOLVING BEACON



Type DCB24

THIS new revolving beacon was built by the Crouse-Hinds Company to meet the specifications of the United States Department of Commerce and is the government standard for use on airways.

Before purchasing a beacon, be sure to see this latest government standard.

"Carried in stock for immediate delivery"

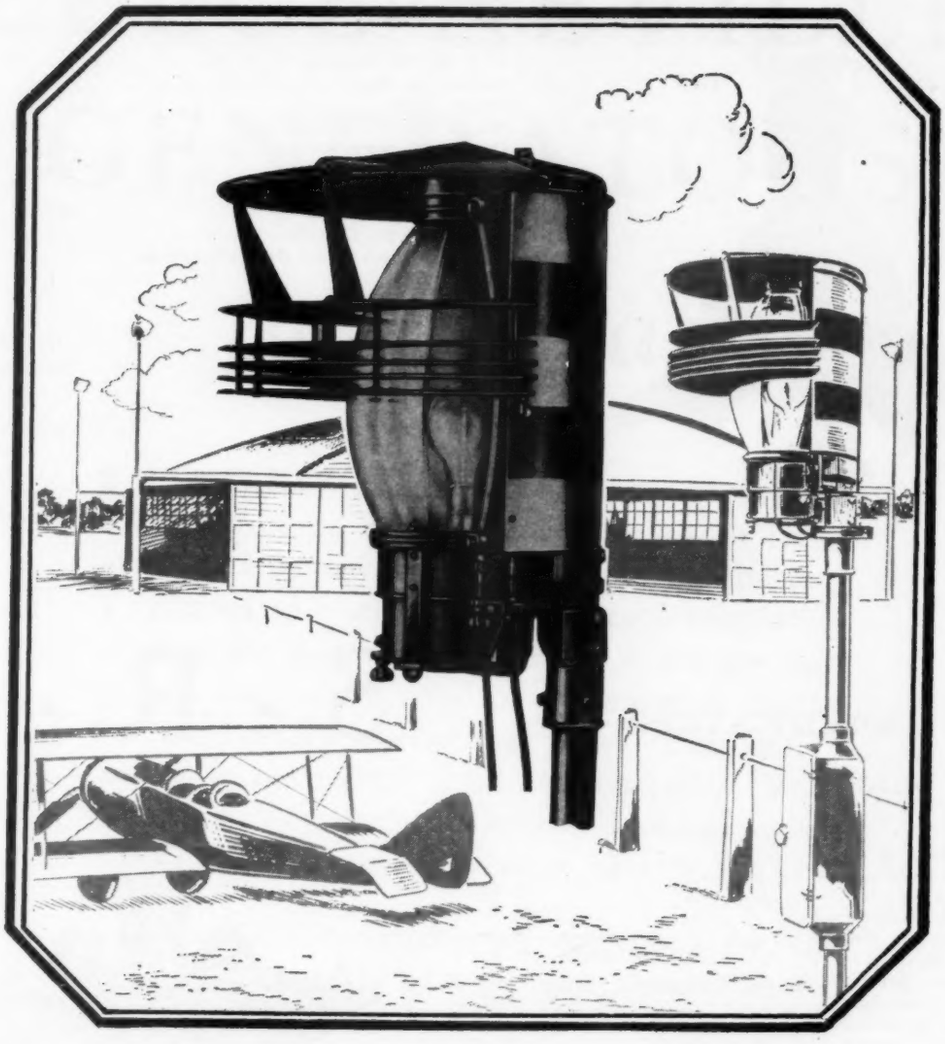
CROUSE
SYRACUSE,

NEW YORK CHICAGO PHILADELPHIA BOSTON DETROIT PITTSBURGH CINCINNATI

C-H 396

THANK YOU *for mentioning* AVIATION

A NEW 180-DEGREE AIRPORT PROJECTOR



Type AKP

THIS new airport floodlight is the last word in airport illumination. Entirely new in principle and design, it gives perfect illumination without glare.

Before lighting your field, investigate the latest and best in landing field floodlights.

"Everything in lighting equipment for Airports"

- HINDS

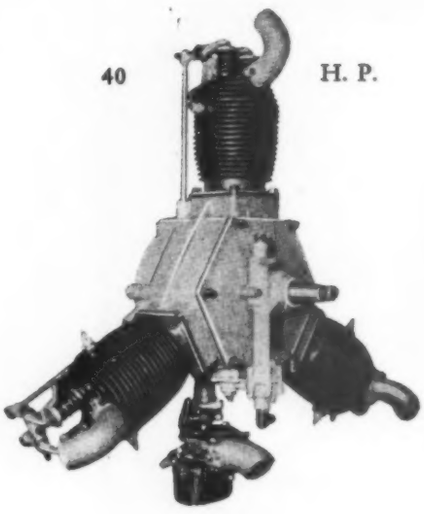
N. Y., U. S. A.

CLEVELAND ATLANTA ST. LOUIS SAN FRANCISCO MINNEAPOLIS MILWAUKEE

THANK YOU *for mentioning* AVIATION

S - R - 3

40 H. P.



SPECIFICATIONS

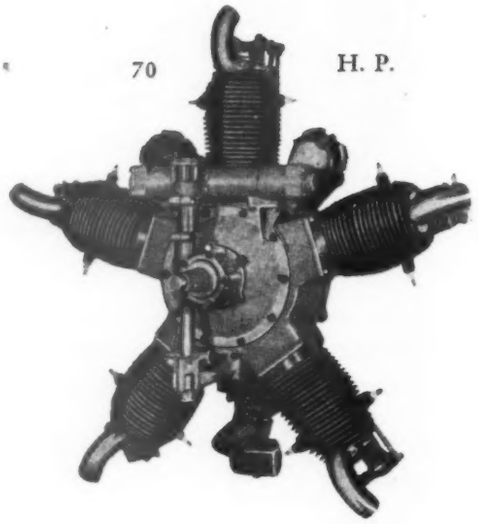
Number of Cylinders	3
Bore	4⅛"
Stroke	4¾"
H. P. @ 1800 r. p. m.	40
Compression Ratio	4.8 - 1
Weight, Bare	117 lbs.
Weight with All Accessories	153½ lbs.
Domestic Shipping Weight	Approx. 225 lbs.
Boxed for Export	Approx. 305 lbs.
Volume Export Box	20½ cu. ft.
Dimensions Export Box	38" x 38" x 20"
Spark Plugs per Cylinder	2
Magnetoes (Each fires 1 plug each cylinder)	2
Carburetor	1½" balanced
Crankshaft Material	3140 S. A. E.
Diameter Crankshaft	1 37/64"
Connecting Rod Bearing	1 7/16" x 2"
Pistons	Aluminum Alloy
Rings on each Piston	3
Main Bearings	Roller
Propeller Thrust Bearing	Radial Deep Groove Ball
Oil Pump	Gear Type
Scavenger Pump	Gear Type
Fuel Consumption	.58 lbs. per HP hr.
Oil Consumption	.029 lbs. per HP hr.

S - R - 5

SPECIFICATIONS

Number of Cylinders	5
Bore	4⅛"
Stroke	4¾"
H. P. @ 1800 r. p. m.	70
Compression Ratio	4.8 - 1
Weight, Bare	190 lbs.
Weight with All Accessories	226½ lbs.
Domestic Shipping Weight	Approx. 300 lbs.
Boxed for Export	Approx. 335 lbs.
Volume Export Box	24 cu. ft.
Dimensions Export Box	40" x 40" x 20"
Spark Plugs per Cylinder	2
Magnetoes (Each fires 1 plug each cylinder)	2
Carburetor	1½" balanced
Crankshaft Material	3140 S. A. E.
Diameter Crankshaft	1 25/32"
Connecting Rod Bearing	1 11/16" x 3"
Pistons	Aluminum Alloy
Rings on each Piston	3
Main Bearings	Roller
Propeller Thrust Bearing	Radial Deep Groove Ball
Oil Pump	Gear Type
Scavenger Pump	Gear Type
Fuel Consumption	.58 lbs. per HP hr.
Oil Consumption	.029 lbs. per HP hr.

70 H. P.



SZEKELY AIRCRAFT CORPORATION

AIRCRAFT ENGINE DIVISION

HOLLAND, MICHIGAN

LEECE-NEVILLE GENERATORS

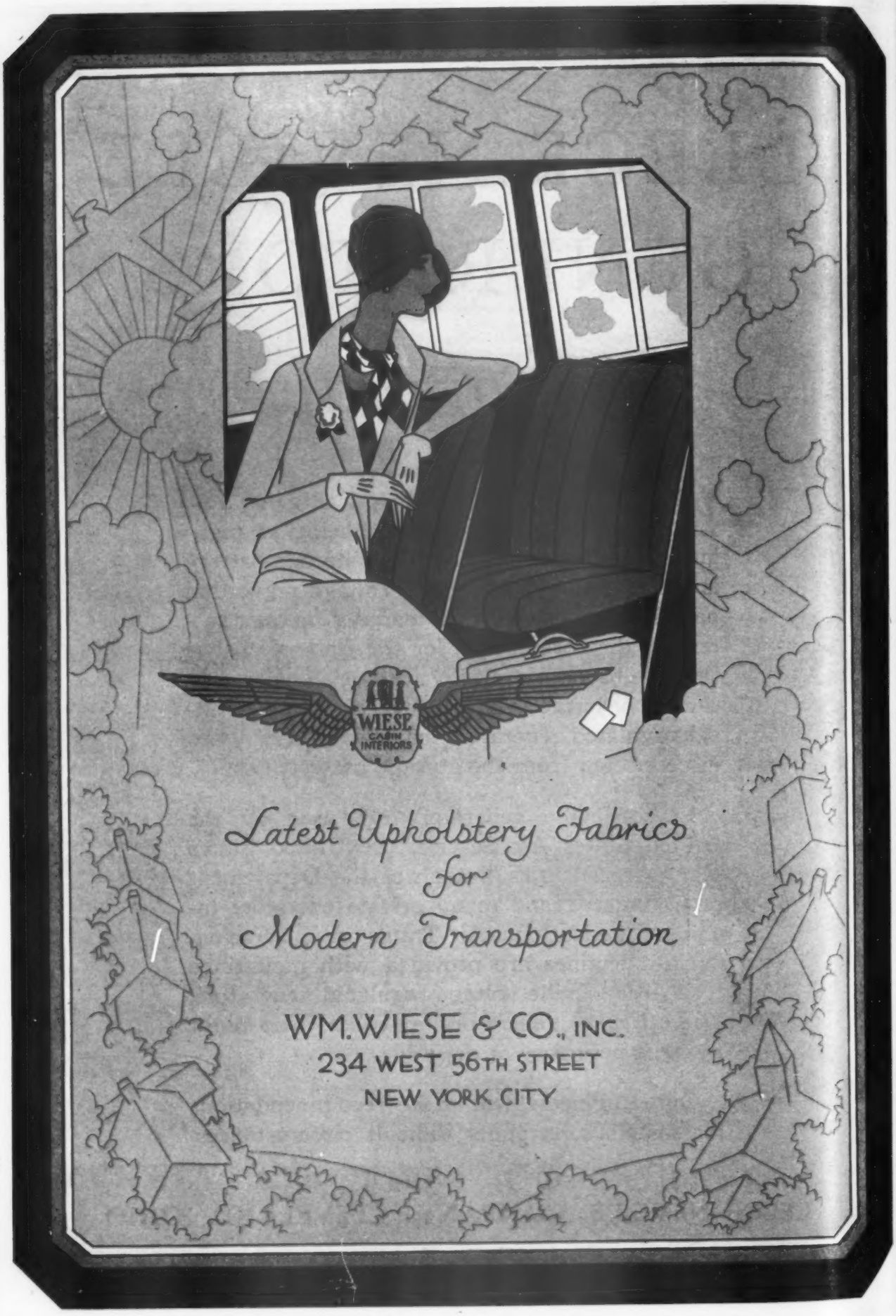
for aircraft

LEECE-NEVILLE aeronautical generators are voltage regulated, and being so regulated the size and weight of the storage battery is reduced to a minimum. Voltage regulation permits the generator to charge a storage battery at the correct rate for the state of charge that the battery is in at that time. The battery can not be burned out from over charging. Voltage regulated generators may also be used when disconnected from the storage battery.

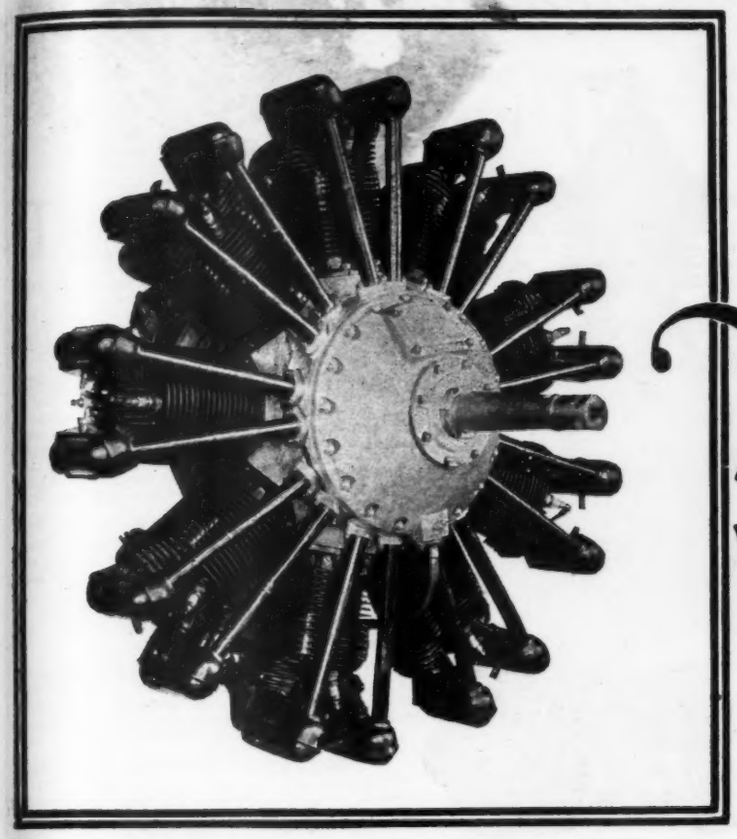
Leece-Neville generators are used by the United States Air Service, the United States Navy, Aeronautics Branch of the Department of Commerce, and many private operators including the National Air Transport and Boeing. Wright engines are provided with mountings for Leece-Neville voltage regulated generators. Leece-Neville generators are used where night flying is necessary or desirable.

Our Engineers will make recommendations for installations under difficult circumstances.

LEECE-NEVILLE COMPANY, CLEVELAND, OHIO



THANK YOU *for mentioning* AVIATION



The NEW VELIE L-9 AIRCRAFT ENGINE

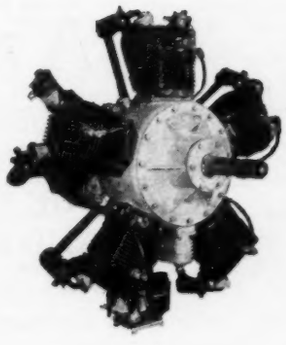
Predestined to achieve the same spectacular success for which Velie M-5 Aircraft Engines are already conspicuous, comes the New Velie L-9 Aircraft Engine.

Velie engineers have built into this new nine cylinder radial motor the same uncompromising quality, the same thorough precision and the same Velie long life that are known the world over.

Leading aeronautical engineers who have read advance specifications and witnessed trying tests, have marvelled at this new expression of progress in aviation.

Airplane manufacturers and others who are interested, are cordially invited to inquire for further details.

VELIE MOTORS CORPORATION, *Moline, Illinois*



VELIE M-5

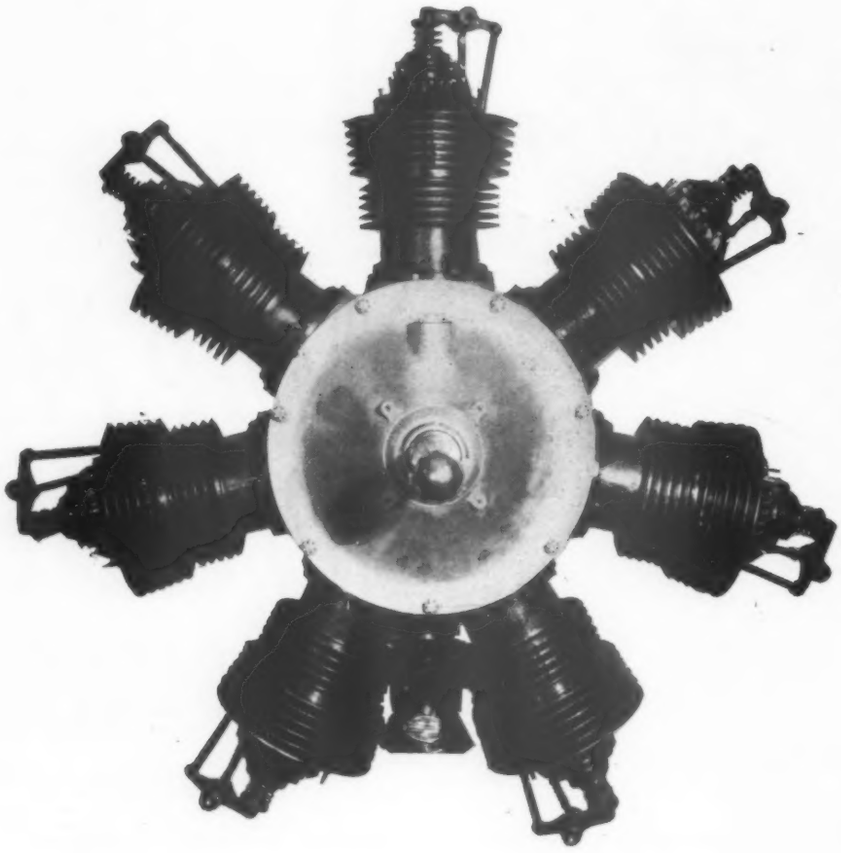
5 cylinder, air cooled, radial aircraft engine. Government approved type. Certificate N. 4

"Ask the Pilot"

Long Life **VELIE**

OWNED AND OPERATED BY ITS FOUNDER
... 1908-1928 ...

AERONAUTICAL CHAMBER OF COMMERCE



A 7 CYLINDER RADIAL ENGINE

OF 585 CUBIC INCHES DISPLACEMENT THAT CONFORMS THROUGHOUT ITS ENTIRETY TO THE REQUIREMENTS OF MODERN COMMERCIAL AND SPORT AIRPLANES.

FURTHER PARTICULARS WILL BE GLADLY FURNISHED UPON REQUEST

KIMBALL AIRCRAFT CORP., NAUGATUCK, CONN.

THE BEETLE

THANK YOU *for mentioning* AVIATION

AVIATION offers another service to its readers

Books on aviation regardless of where published may be obtained through AVIATION'S book department.

THE following books were chosen in an effort to compile a concise list of the best of modern aeronautical publications:

AERODYNAMICS

AERODYNAMICS AND AIRPLANE DESIGN. By Edward P. Warner (598 pages) .....$ 7.50
Text on aerodynamics and its applications to airoplane design, divided into three parts; airfoils and airfoil combinations, performance calculations, maneuverability and stability. 1927 (advanced student).

APPLIED AERODYNAMICS. By Leonard Bairstow (565 pages).....$12.00
Theoretical and practical aerodynamics as applied to airplane design. 1920 (advanced).

ANNUALS

AIRCRAFT YEAR BOOK (551 pages)...$5.25
Published by the Aeronautical Chamber of Commerce. Records the events, records, airplanes, and data on aircraft manufacturers for 1927. Back issue obtainabile.

AMERICAN AIRCRAFT DIRECTORY
(176 pages) .....$ 3.00
Cloth .....$ 5.00
Directory of the aircraft industry by states and cities. Lists personnel of the various government bureaus, educational institutions, etc., data on aviation competitions and meets, landing fields and seaplane anchorages. 1928. Revisions published periodically.

JANE'S ALL THE WORLD AIRCRAFT
(534 pages) $12.75
Descriptions, photographs, and drawings of airplanes, engines, balloons and airships. 1927.

WHO'S WHO IN AMERICAN AERONAUTICS (200 pages, approximately)..$ 1.25
Names and past activities of everyone connected with the aeronautical industry. 1928.

BALLOONS AND AIRSHIPS

AEROSTATICS. By Edward P .Warner
(112 pages) .....$ 3.25
Properties of the atmosphere and airship gases and their effects on free lighter-than-air craft. 1926 (advanced).

AIRSHIP DESIGN. By C. P. Burgess
(300 pages) .....$ 9.00
Structural design and performance of rigid airships. 1927 (advanced student).

PRESSURE AIRSHIPS. By Thomas L. Blakemore and W. Watters Pagon (311 pages) .....$ 8.00
Design and construction of non-rigid and semi-rigid airships. 1927 (student).

DESIGN AND CONSTRUCTION

AIRPLANE DESIGN AND CONSTRUCTION. By Otterine Pomilio
(404 pages) .....$ 5.00
Design and construction of the airplane, performance calculations, and stress analysis. 1919 (advanced).

AIRPLANE STRUCTURES. By Alfred J. Pippard and Laurence J. Pritchard
(359 pages) .....$ 7.50
Airplane structures and stress analysis. 1919 (advanced).

DESIGN OF SCREW PROPELLERS.
By Henry C. Watts (340 pages).....$ 8.50
Theory, design and construction of airplane propellers. 1920 (advanced).

MODERN AIRCRAFT. By Victor W. Page (855 pages) .....$ 5.00
Construction of airplanes and engines with descriptions of modern types. Data on aircraft accessories, airships and balloons, inspection, rigging, etc. 1927 (elementary student).

ENGINES

AIRCRAFT ENGINE INSTRUCTOR.
By A. L. Dyke (372 pages).....$ 5.28
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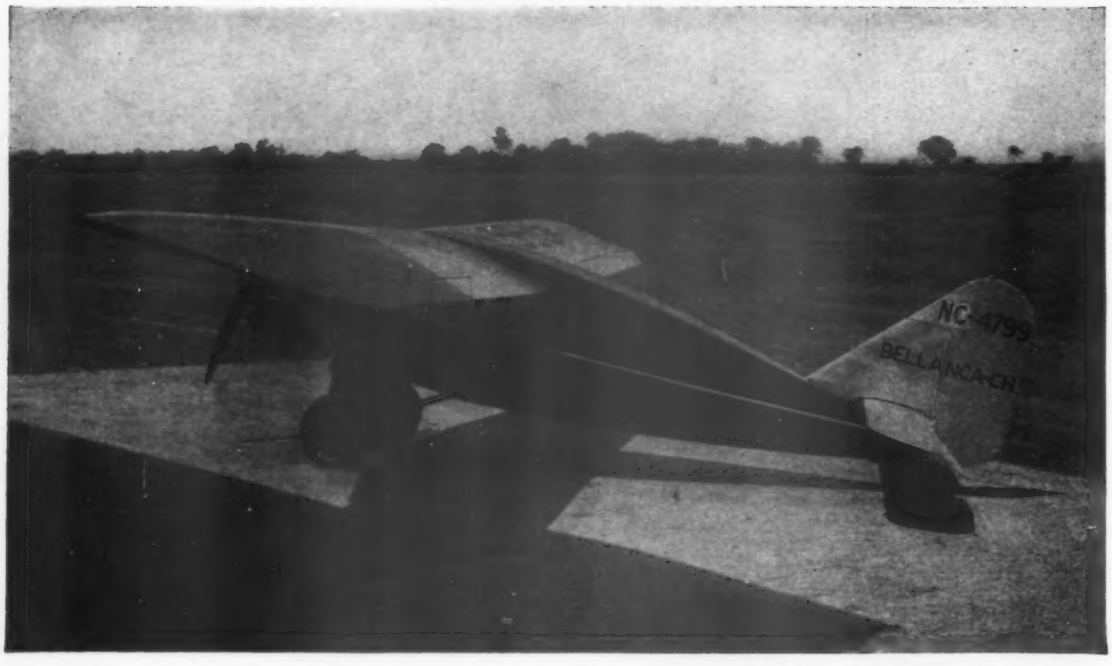

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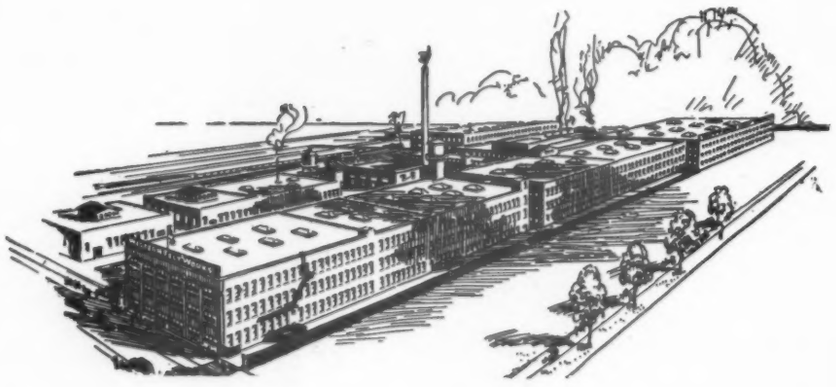

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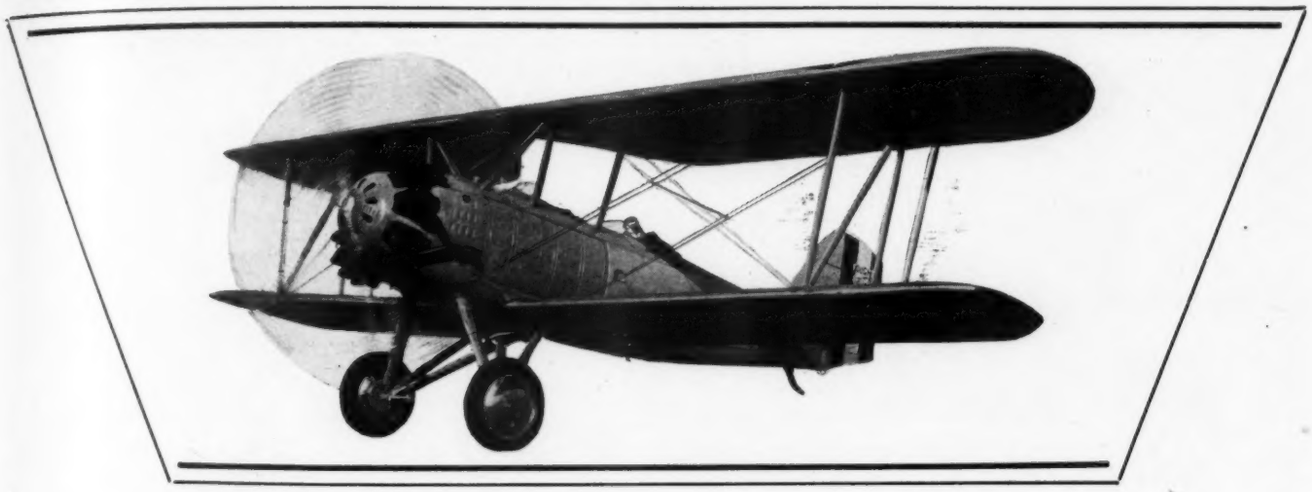

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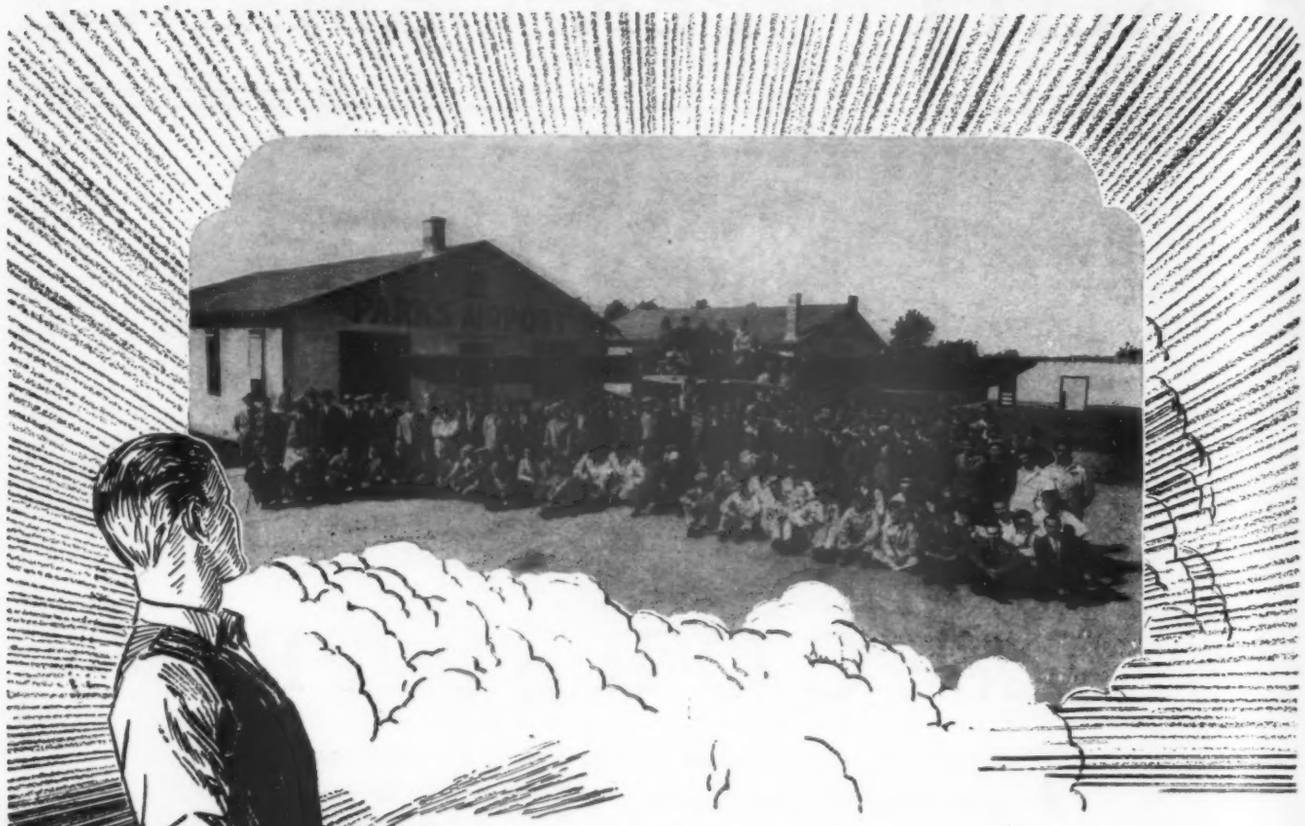

IMPORTANT ABOUT YOUR TRAINING

IT'S time for a plain little talk on this question of aviation-training. A hundred or more schools are clamoring for students, promising anything from a $20-a-week job to the presidency of "Super-Interplanetary Aero-Navigation, Ltd.," in six months.

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What you must have is *training*. Flying is no longer a matter of personal bravery. It's a profession—an art, in which education, training, and experience play as great a part as they do in engineering, or law, or major-league baseball.

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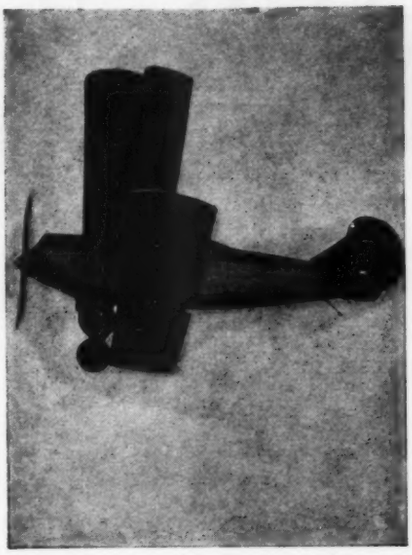
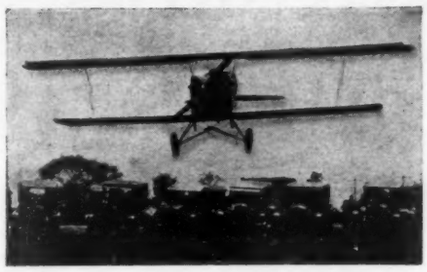


A solo student in flight

FACTS
FOR AVIATION SUCCESS

The better school you choose, the better your chance of success, in this as in any field. Graduates of "Freshwater College" sometimes achieve fame—but it's a hard battle. The man from Cornell, or Yale, or Columbia, has long odds in his favor from the start. And for very good reasons.



Coming in for a perfect landing

What School Offers Most?

Your problem, then, is to choose the school that gives you the best start—the school that equips you fully for what lies ahead of you in aviation.

Only a big school can do that. No small institution can afford the lavish equipment—the famous pilots—the skilled instructors. And the big school, properly managed, can offer complete training at no greater cost—sometimes at less—than a small place must charge. It actually costs you no more to learn aviation at Parks Air College than at schools which offer you nothing like Parks' opportunities. Parks has today over 400 students in training. No other civilian school in the country has half that number. Parks has fourteen licensed transport pilots as instructors—26 new-production ships—over $175,000 worth of plant and equipment. Parks is more than an aviation school—it is a University of the Air.

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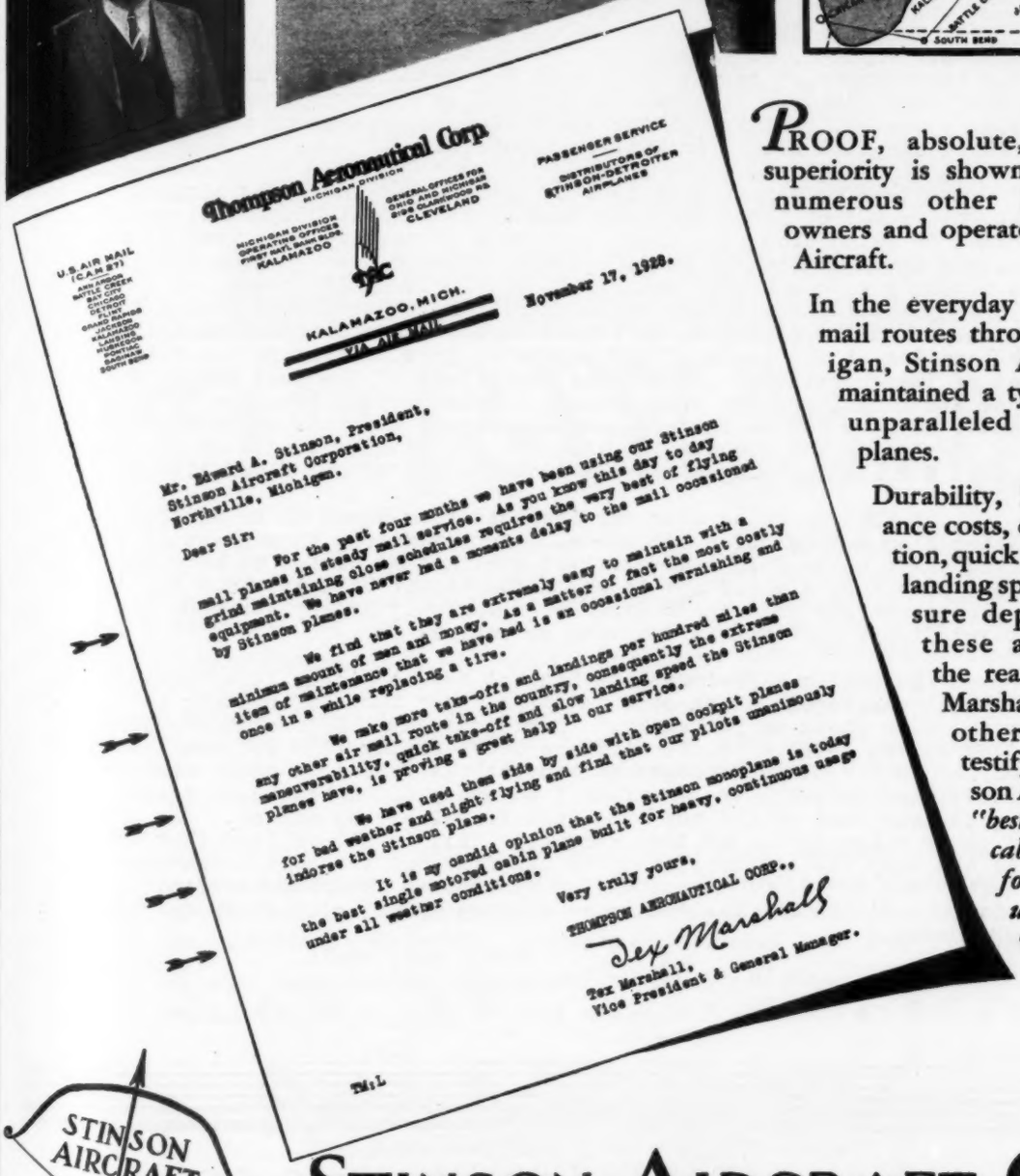

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VIA AIR MAIL

November 17, 1928.

Mr. Edward A. Stinson, President,
Stinson Aircraft Corporation,
Northville, Michigan.

Dear Sir:

For the past four months we have been using our Stinson mail planes in steady mail service. As you know this day to day grind maintaining close schedules requires the very best of flying equipment. We have never had a moments delay to the mail occasioned by Stinson planes.

We find that they are extremely easy to maintain with a minimum amount of men and money. As a matter of fact the most costly item of maintenance that we have had is an occasional varnishing and once in a while replacing a tire.

We make more take-offs and landings per hundred miles than any other air mail route in the country, consequently the extreme maneuverability, quick take-off and slow landing speed the Stinson planes have, is proving a great help in our service.

We have used them side by side with open cockpit planes for bad weather and night flying and find that our pilots unanimously indorse the Stinson plane.

It is my candid opinion that the Stinson monoplane is today the best single motored cabin plane built for heavy, continuous usage under all weather conditions.

Very truly yours,
THOMPSON AERONAUTICAL CORP.,
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Vice President & General Manager.

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PROOF, absolute, of Stinson superiority is shown by this and numerous other letters from owners and operators of Stinson Aircraft.

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STINSON AIRCRAFT

STINSON AIRCRAFT CORP.
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Piling up the Proof

November 10, 1928.

Mr. Walter H. Beech, Pres.,
Travel Air Manufacturing Co.,
Wichita, Kansas.

Dear Mr. Beech:

The splendid day to day performance of the Travel Air biplanes in Parks Air College, as revealed in a recent recapitulation of our flying log, may be of interest to you and I give you herewith some of the high lights of the record supporting a conclusion to which I have long since arrived. Namely, that Travel Air makes the finest, safest and sturdiest commercial airplane now in production anywhere.

Since we began operations on March 21 at the Parks Airport, in the St. Louis Metropolitan District just south of East St. Louis, we have purchased 39 ships from your company. Some of them we have used in our training program and others we have sold. At the outset we used four ships in our flying school, today as I write this letter there are 19 of your OX-5 jobs on the line and in the air. It goes without saying that these ships and the others we have used have taken a terrific amount of rough handling at the hands of our students, particularly in the early stages of their training. Since the early part of the past summer we have at all times had more than 200 men in our flying classes - today for instance, we have 229 so that you can understand that the ships are kept in the air during all the daylight hours. In addition, some of them have been used for night flying since the installation of our flood lights.

I find on going over our log that from March 21 to October 30 our ships flew a total of 6,535 hours. Approximately 48 percent of the time was taken up by solo students, yet during that period we have had only one crack-up, a minor one in which the repair bill was $650.00. That represents our sole crash expense. Our only injury has been a fractured finger suffered in starting an engine.

During that period there has not been a single structural failure. Undercarriages, which come in for a major share of beating on training work, have stood up perfectly. During our most active month, July, we piled up the total of 1,351 airplane hours flying time without a single forced landing. Since we began our operations forced landings from all causes totaled only 21, or less than 1 to every 300 hours. It is interesting to note that we did not come upon Travel Air by chance. We have tried other ships and found them wanting. All in all we find that Travel Air is not only the sturdiest ship we can find but the most maneuverable, the safest and the one most suited for all around training work, not only for airdrome flying but for the cross country travel with which our students are graduated.

Yours very truly,
PARKS AIR COLLEGE, INC.
Olivia F. Parks
Vice President.

O.L.Parks-GB

THE STORY OF TRAVEL AIR ON REQUEST

TRAVEL AIR MANUFACTURING CO.

The Standard of Aircraft Comparison

WICHITA, KANSAS

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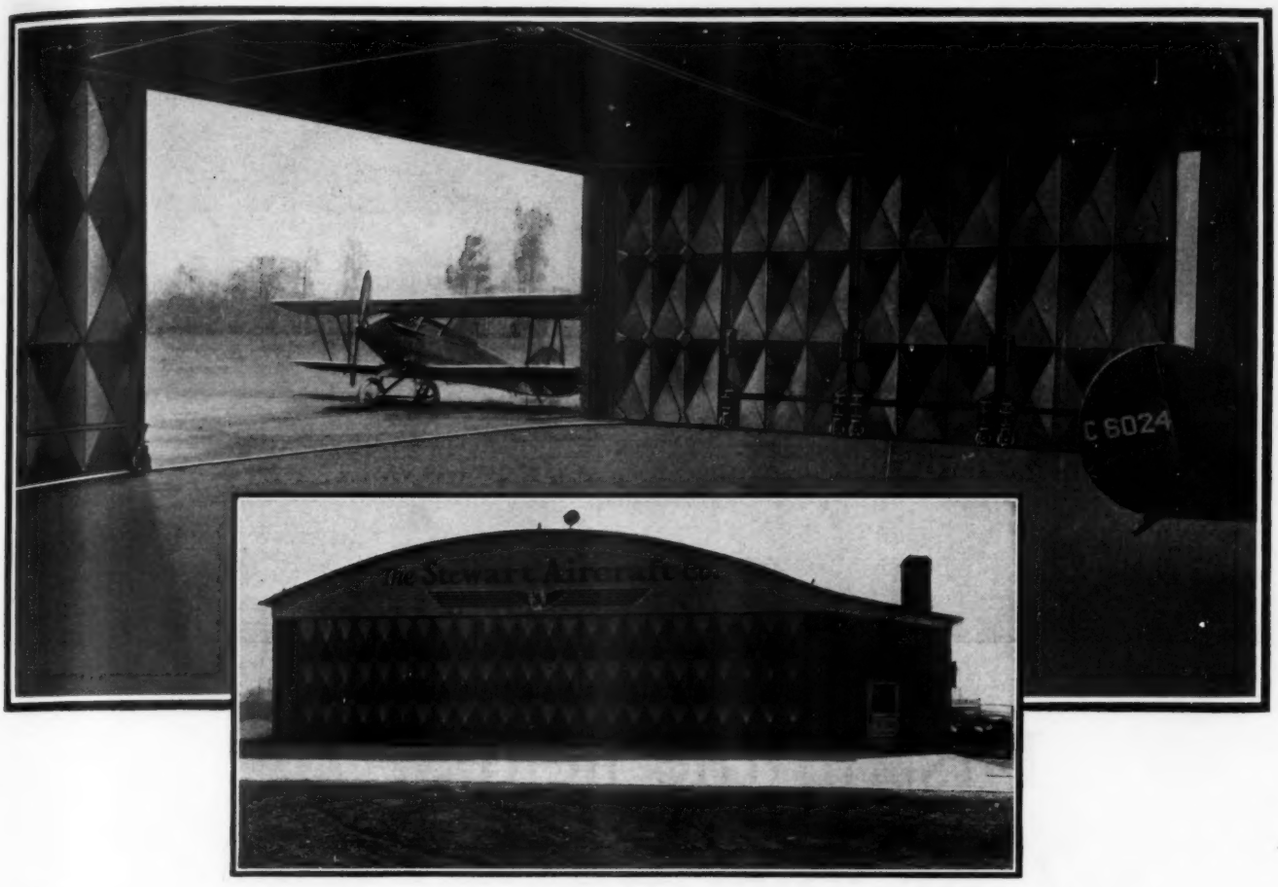

There's an R-W Way for *every* doorway

The hangar of the Stewart Aircraft Company at the Cleveland Municipal Airport has a storage capacity of 10 planes. The doorway of the hangar is 56 ft. wide by 13 ft. 9 in. high.

When Richards-Wilcox engineers were called in to solve the doorway problem for this large opening, they installed 8 all-steel doors. They operate on curved floor rails which permit the doors to slide back to either side, allowing a full width unobstructed opening without center posts.

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The Richards-Wilcox all-metal construction assures a door that will not warp or swell because of rain, snow, and freezing weather.

Richards-Wilcox all-metal doors and door hardware are not just so much hardware and material. Behind every installation are Richards-Wilcox engineers, who design doorway equipment to function efficiently, economically, and without trouble.

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NOW THE MODERN RAILROAD SAYS —

LAST STOP TRANSFER TO THE SKY . . .

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It was a splendid acknowledgment of the greater strength and safety of Hamilton all-metal construction . . . of the greater speed and economy of Hamilton advanced design . . . of the skill and forethought that made possible a new measure of power in reserve . . . and of the luxurious comfort of the great metal enclosed cabin.

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Now when passengers from some of the outstanding railroads of the country leave the security of their steel coaches . . . to transfer to the sky . . . they do so with the confidence of knowing that in Hamilton Metalplanes are all the features of safety that modern skill and engineering has yet devised.

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THE Hamilton Metalplane has passed the inventive period of trial and error and stands today as one of the outstanding achievements of modern aviation. It is constructed entirely of metal . . . alclad, non-corrosive duralumin . . . because metal has proven its superiority . . . because it is weather-proof . . . fire-resisting and non-rusting . . . because it makes possible a standard of safety that can be achieved in no other way . . . and because durability and continued service are the heart of airplane value.

The brilliant performance of Hamilton Metalplanes is a by-word from Alaska to the Tropics. The fleet of planes in air-mail and air-rail service maintain their schedules with railroad precision. The unusual speed and power of the Hamilton Metalplane makes it bigger than the weather.

Low in up-keep . . . low in depreciation . . . low in operating costs, but high in efficiency . . . the Hamilton Metalplane combines ideally those features so necessary to successful air-line operation. Let us tell you the full story of Hamilton Metalplanes, or see them at the Chicago Show.

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The Aeromarine Klemm—AKL25 plane, known in Europe as the Klemm monoplane, was adjudged the most efficient general-purpose airplane of its type, in the recent International Light Airplane Meet held at Orly Aerodrome, Paris. Of the numerous light planes entered in the meet, only seven survived the rigid tests.

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The trials which gave the AKL25 the highest total number of points scored by any plane, was based not alone on efficiency of operation, but included the consideration of such qualities as comfort — protection against turning over—time required to start engine —dual control—anti-fire protection—speed of dismantling and assembling plane—take off from muddy field and climb.

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For the complete story of the AKL25—*the wonder-plane of two continents*, write the

AKL25 LAND TYPE

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Quaker State Aero goes through the exclusive Quaker State "extra step" in refining, which removes from every gallon a quart or more of material that has no value in lubricating an internal combustion motor. Instead of a quart of waste in every gallon, you get *four* full quarts of the finest lubricant that man and Nature have produced.

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Quaker State Aero is sold from Coast to Coast. Over 500 distributing warehouse stocks and 100,000 dealers in the United States and Canada.

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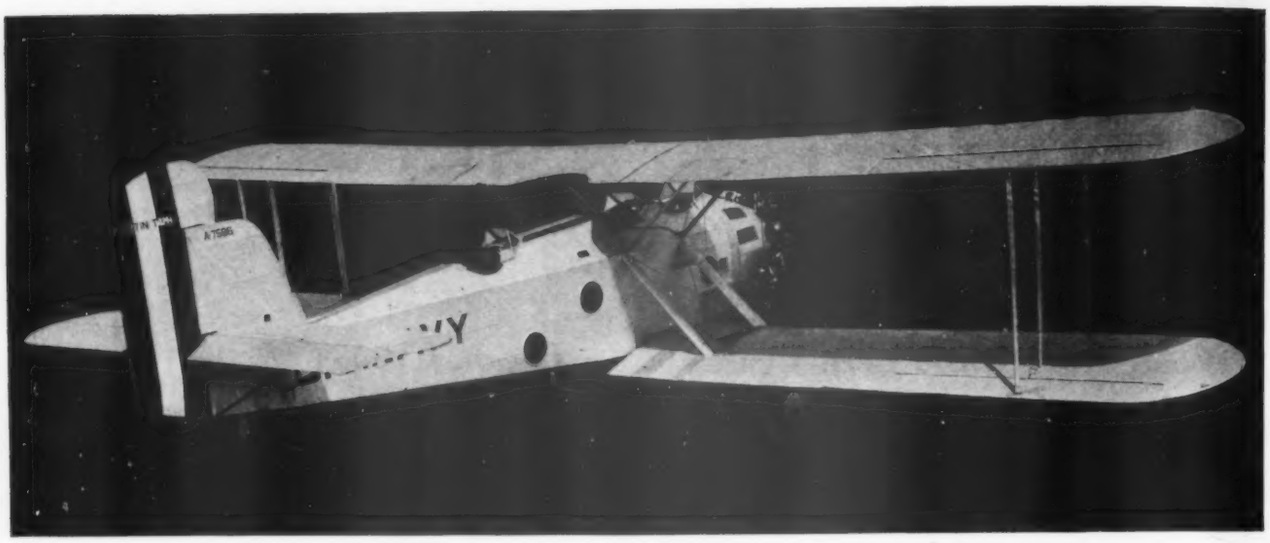
At the Chicago Show



An Invitation . . . to Visit the World's Finest Most Modern Aircraft Factory

IN addition to assurances of a royal welcome to all trade visitors at our exhibit in Chicago, or our show headquarters at the Lake Shore Athletic Club, we extend to them a hearty invitation to visit our Cleveland plant at any time. Here it will be possible to see in actual operation the advanced methods of aircraft manufacture that mean uniform quality without excessive cost—the broad engineering facilities that have already contributed so much to the advancement of aeronautics. You will see the most complete equipment in the industry for the treatment and fabrication of duralumin. And you will see and learn many other things which will convince you of our ability to carry out our pledges to the trade and the public in the fullest measure.

Our plant is located at 16800 St. Clair Avenue, a half-hour's drive from the business center of Cleveland. For those who wish to drop in on us via the air, we have an excellent private landing field with hangar facilities. We trust that all our friends in the trade, old and new, will find it convenient to visit us at the earliest possible date. We feel that we have something to interest everyone, regardless of his capacity or connection with the trade.

C. F. VAN SICKLEN,

Vice-President and Director of Sales.

The Famous "MARTIN BOMBER"

Now Available for Commercial Use

The illustration above shows a Martin "74" Bomber, a duplicate of which, completely uncovered, will be on exhibition at the Chicago show through the courtesy of the Bureau of Aeronautics, U. S. Navy Department. This ship, with a wing spread of 53 feet and powered with a 525-H.P. radial air-cooled engine, weighs only 3,850 pounds and will lift approximately its weight in pay load while maintaining a high standard of speed and maneuverability. It will be available commercially as a remarkably efficient carrier of mail, freight and passengers. Several different fuselage arrangements will be provided to fit all needs. A smaller model, adaptable for either training or cross-country purposes, will be shortly announced.

The opportunity to purchase for commercial uses a type of ship which has met U. S. Navy standards with so wide a margin of satisfaction, should appeal to all operators of transport lines. The prices, when announced, will be considered most reasonable by all. Judged from whatever standpoint, the Great Lakes Line, carrying on standards that have led since the earliest pioneer days, offers the utmost in reliability, safety, and pay-load performance. Inquiries from all commercial and military sources are cordially invited.

"You Will Learn *the* Remarkable Facts *About* * GREAT LAKES *Aircraft*

AIR transport operators, aircraft distributors, flying school proprietors, and all close followers of aviation will welcome the coming opportunity to acquaint themselves with all facts behind the new name which has flashed across the aeronautical horizon—Great Lakes Aircraft Corporation. Ever since the announcement that heralded the transfer of the Glenn L. Martin plant at Cleveland into these strong new hands, the entire industry has sensed great developments in store for the future. The information and exhibits which have been prepared for the International Aeronautical Exhibition at Chicago, December 1st to 10th, 1928, will disappoint no one, however high his expectations may be.

Visitors to the Great Lakes exhibit, located in the First Regiment Armory, will have an opportunity to inspect one of the finest examples of aircraft design and construction ever placed on view. The Martin "74" Navy Three-Purpose Bombing, Torpedo, and Reconnaisance Plane, powered with Pratt & Whitney "Hornet" engine, is the culmination of twenty years of experiment and research, coupled with production standards of the highest efficiency. The result from an engineering viewpoint will amaze the most experienced observers. The performance, now a matter of record with the U. S. Navy Department, is destined to revolutionize all present commercial standards.

In addition to this ship and others shortly to be announced, we offer an all-duralumin U. S. Navy standard seaplane float that is a marvel for lightness and seaworthiness. We also offer the most elaborate facilities for the manufacture of duralumin parts of all sorts. Examples of interest to all manufacturers will be on display at our exhibit. Learn the remarkable story behind this great new-old company and its products. What you will see and hear will convince you that Great Lakes has much to offer to the entire industry.

MILITARY . . . NAVAL . . . COMMERCIAL AIRPLANES
SEAPLANE FLOATS . . . DURALUMIN PARTS

GREAT LAKES AIRCRAFT CORP.

CLEVELAND, OHIO

* *Great Lakes Aircraft Corporation is a manufacturing concern founded upon and continuing the finest traditions in aviation history, having acquired the Cleveland plant, tools, and design and patent rights of the Glenn L. Martin Company. This business, built up by Mr. Martin over a period of twenty years, will be expanded and continued virtually intact by the new management. Realizing fully the responsibility that this task involves, we have pledged our faith with Mr. Martin to maintain, and improve wherever possible, the high standards of engineering and manufacturing for which his name has ever stood. We renew this pledge to the entire aviation industry, which act automatically guarantees the highest measure of quality, dependability and value to be built into all aircraft and parts bearing the Great Lakes seal.

THANK YOU *for mentioning* AVIATION

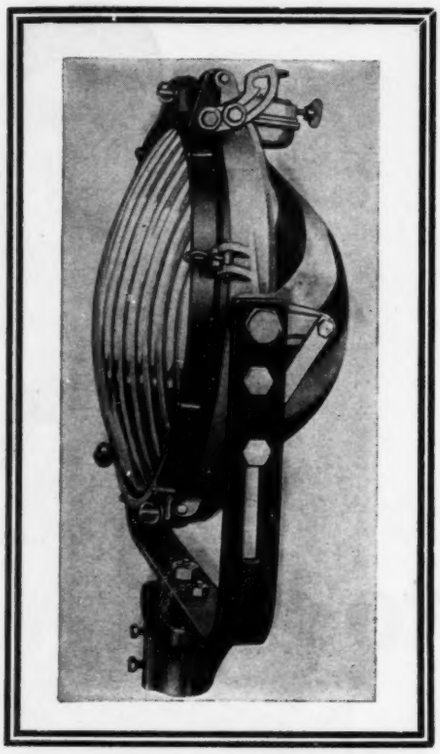
Aeronautical experts are unanimous in the opinion that Newark Metropolitan Airport is destined to be one of the world's foremost aviation centers . . . Its very location —20 minutes from the heart of New York City—makes its future as an air transportation center of the first rank inevitable . . . It enjoys a "close-in" position rivalled by few other airports in the world. Capitalizing its natural advantages to the full, the City of Newark has expended every effort to make this not only one of the most accessible, but also one of the safest flying fields in the United States . . . Its immediate adoption as a home port or terminus by such leading air transport companies as Colonial Air Transport, National Air Transport, Pitcairn Aviation, Inc., New York Airways and United States Air Transport, Inc., is an indication of the recognition it has already won from aeronautical authorities.

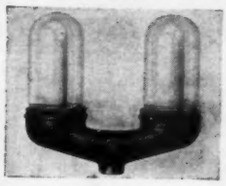
The physical layout of the Newark Metropolitan Airport is ideally suited to safe operation. Two runways, laid out in the form of a cross to take advantage of prevailing wind conditions, each 2,000 feet long and 800 feet wide, provide paved take-off or landing surfaces. An elaborate flood lighting system provides conditions for night operation almost equal to daylight. All nearby wires are laid underground and all water tanks or smoke stacks in the vicinity are plainly marked and lighted at night. Hangar facilities are adequate and designed for quick, easy handling of planes without risk of damage to wings or tail surfaces.

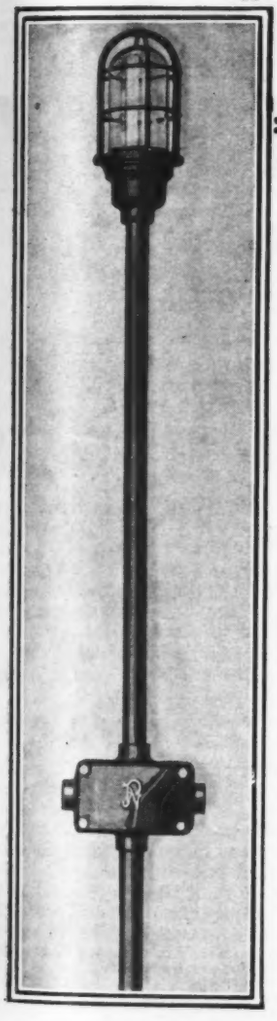
Safety and accessibility have already made Newark Metropolitan Airport an important factor in the growing aviation industry during the very first month of its operation. Further growth will be rapid. Now is the time for manufacturers of aviation equipment to secure adjacent plant sites on attractive terms—and for air services to negotiate to best advantage for field facilities. For complete details, address

DEPARTMENT OF PUBLIC AFFAIRS
Newark, New Jersey

New Airport Lighting Equipment







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Vapor-proof Fixtures
Special Wiring Appliances

THE special features of design and construction of this new line of airport lighting equipment will appeal particularly to operating staff and designers of up to date airports. Simplicity of installation, efficient operation, and unusual reliability are provided in the new Pyle-National fixtures and wiring appliances.

Pyle-National airport lighting equipment is backed by over thirty years of specialized experience in the manufacture of lighting equipment for railroad and industrial use. The Pyle-National Company are the pioneers and the largest manufacturers of locomotive electric headlight equipment.

See the complete display at the Chicago Exposition, December 1 to 9, Space 643.

New

aircraft landing and navigation lights which will set a new standard of efficiency and performance will be exhibited at the Aircraft Exposition at Chicago. Be sure to see this equipment at the Pyle-National booth.

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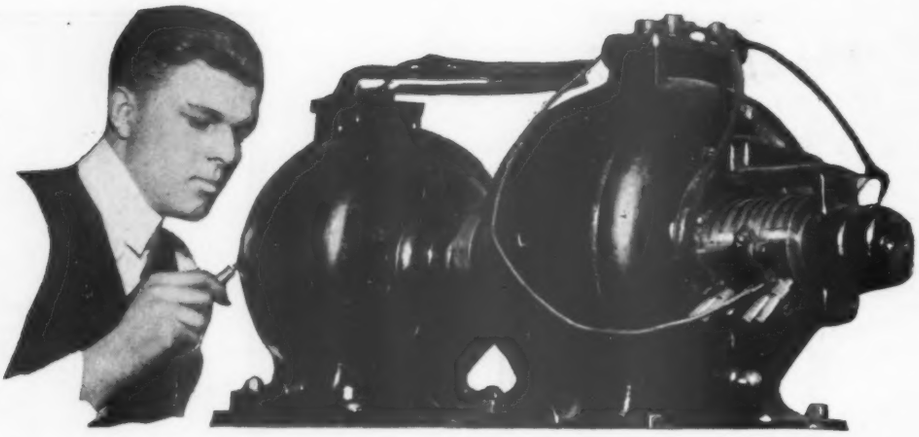

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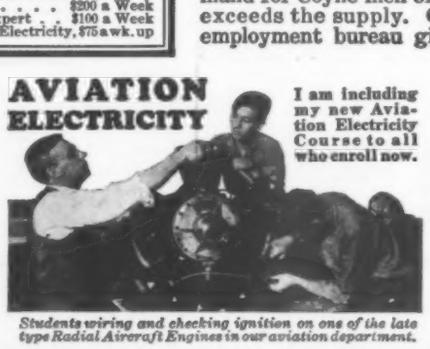

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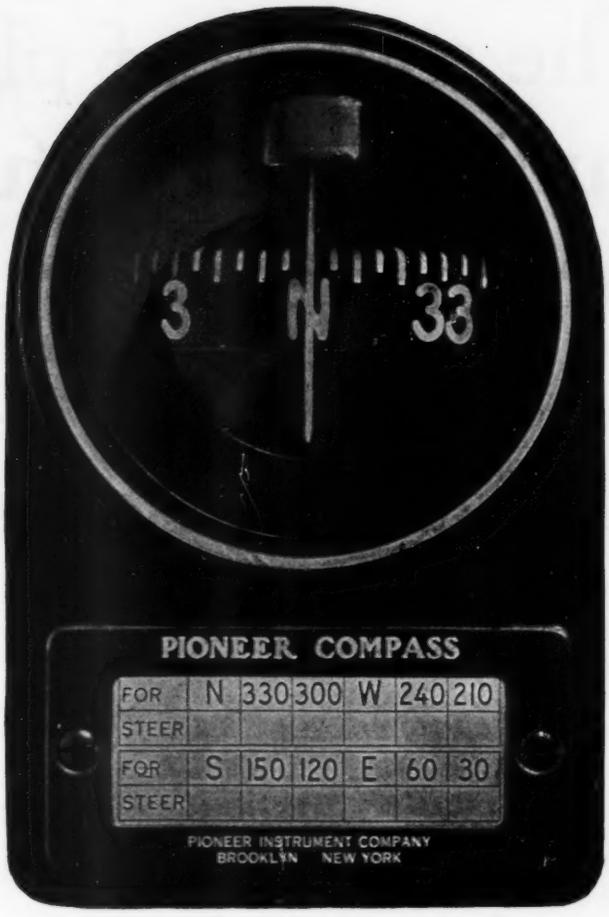

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The new Compass is known as type No. 356. We continue to make the well known types, No. 56, No. 145 and No. 192.

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There's a vital reason when one make of plane so consistently proves the winner in race after race. In the gruelling elimination of contest after contest standard Laird planes have been consistently winning:

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With white hand ground meniscus lenses	15.00
With tinted hand ground meniscus lenses	16.50

Regular Model 6

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Amber, euphos (green) or smoke tinted lenses supplied. Lenses accurately ground to prescription can be fitted in any model.

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U.S. Air Service Model No.7

1928

Modern aircraft and latest goggles

25 years of goggle development runs parallel with aviation progress

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As aviation developed the need of goggles became paramount and Meyrowitz experimented and improved his goggles until they became the standard for safe protection, comfort and accuracy. Never has this research been retarded. Year after year, as aviation grew swifter Meyrowitz made improvements that met the exacting requirements.

Today Meyrowitz Luxor Goggles are still the standard. As manufacturing opticians they know the science of eye protection and as pioneers in aviation goggles they know the needs of flying.

More pilots use Meyrowitz Luxor Goggles than any others made. The crack pilots of the Army, Navy and Marine Corps use them. They are standard equipment on most commercial air lines. For sale at leading sporting goods and optical stores, by aircraft dealers, flying schools and at airports. If you have any difficulty getting genuine Meyrowitz Luxor Goggles write us direct. *Send for 1928 Catalog.*

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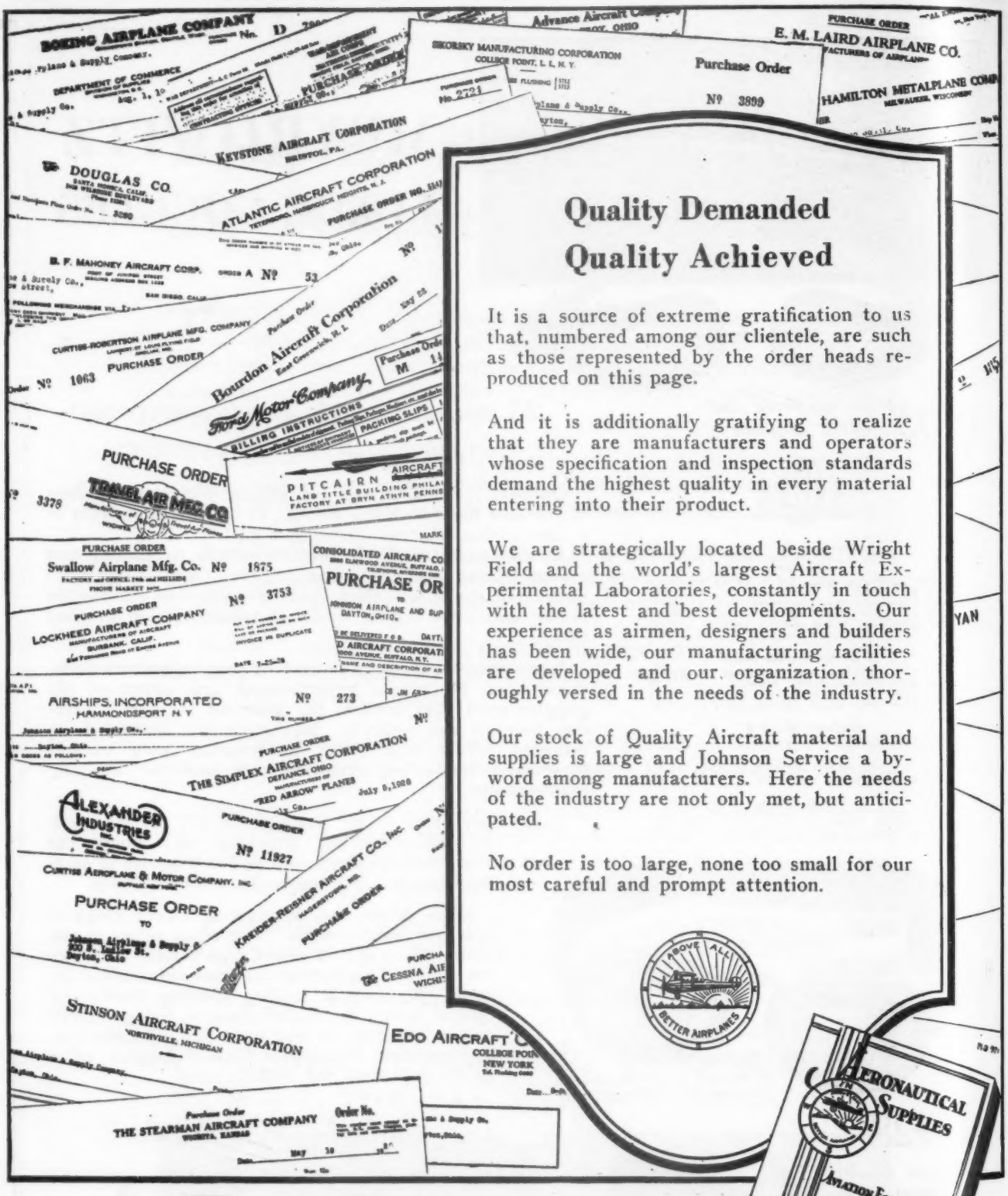

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Quality Achieved

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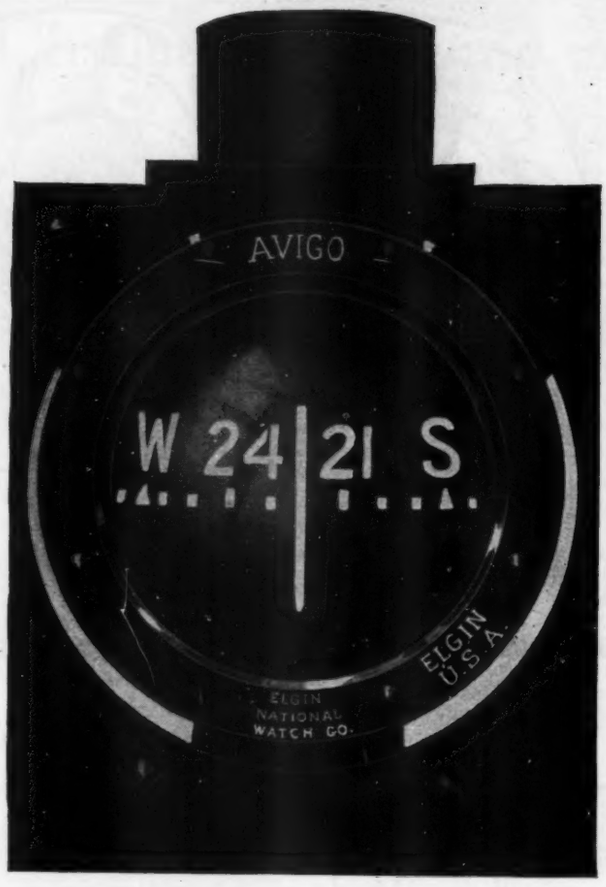

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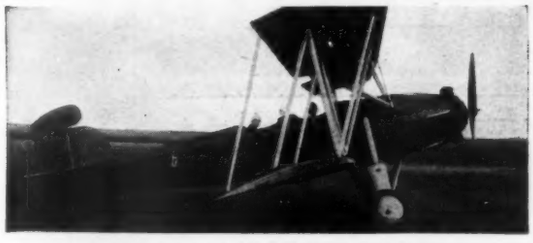
Robin; 3-place Cabin Monoplane with Curtiss "Challenger" installed.



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Curtiss Robin

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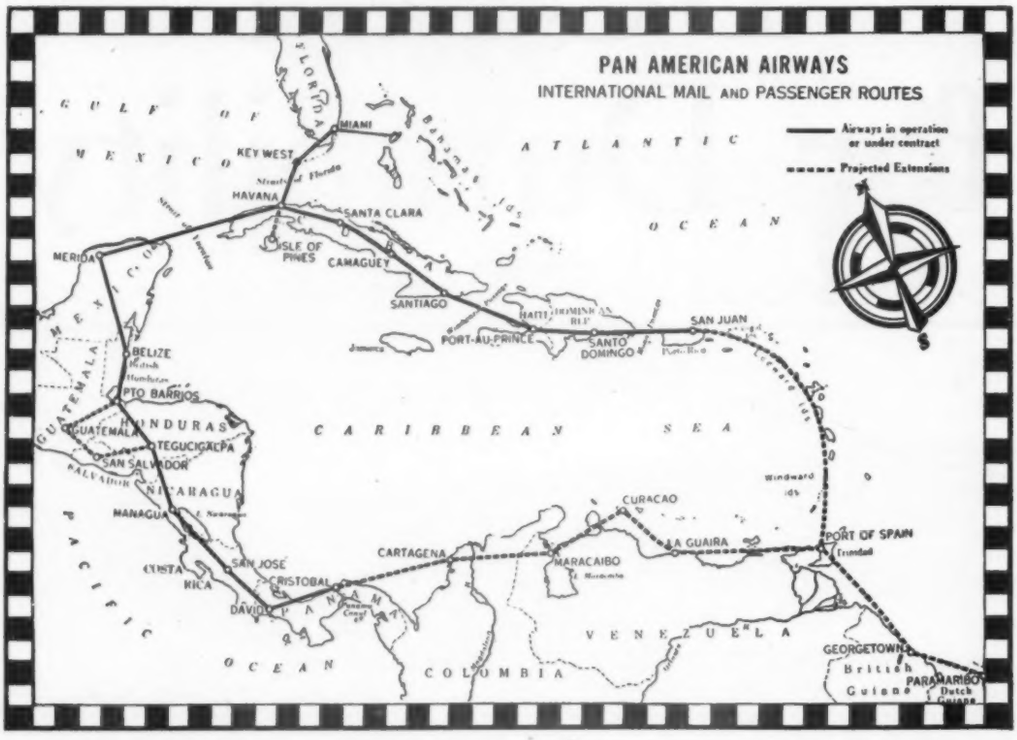

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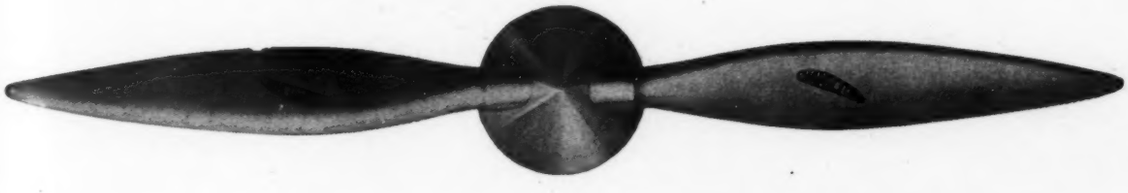

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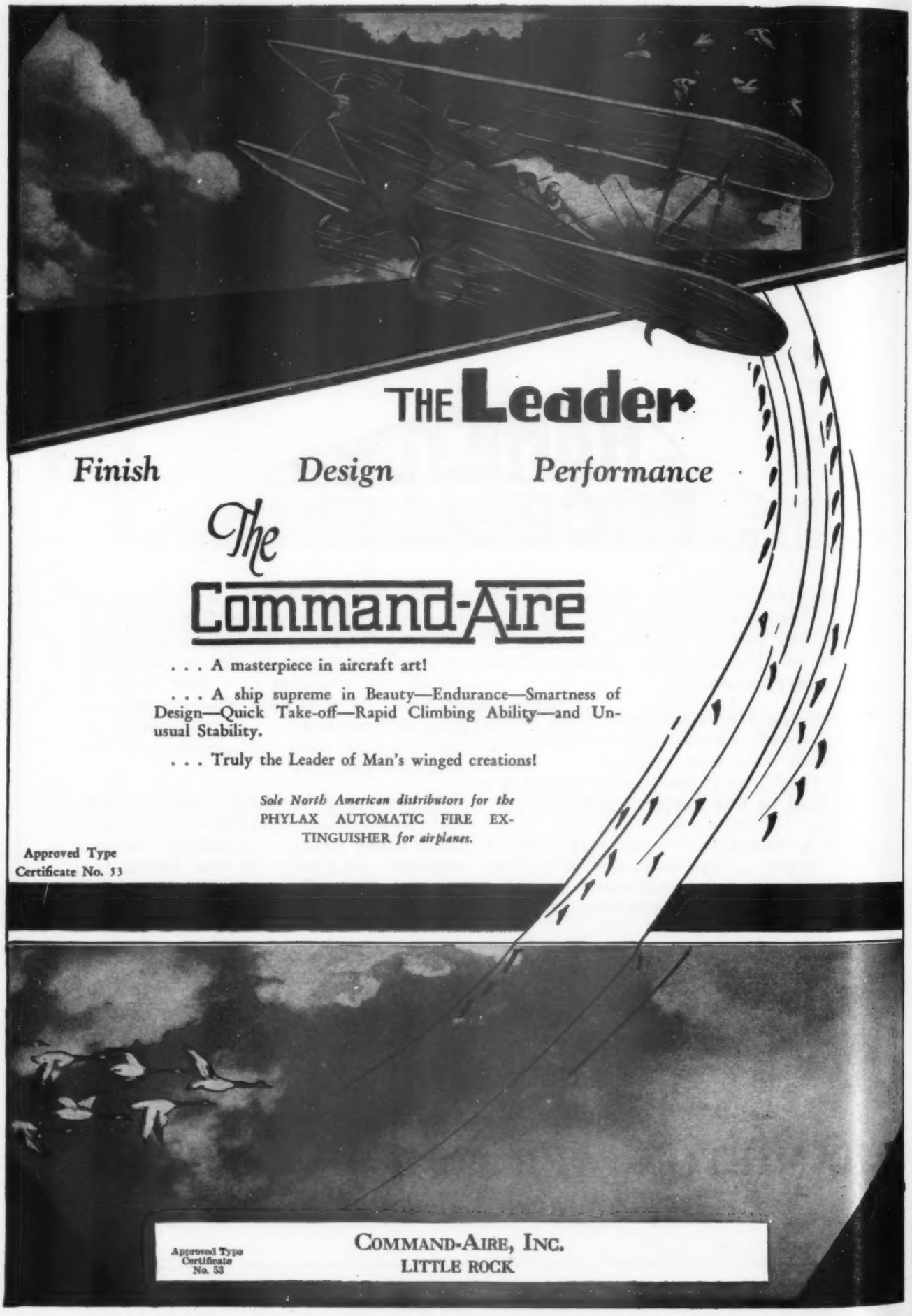
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It deals with modern aircraft engines and miscellaneous equipment, such as carburetors, magnetos, starters, areonautic instruments, etc. It also includes types of aircraft, controls, nomenclature for areonautics and complete information pertaining to air commerce regulations, etc. Adequate space is devoted to the Wright "Whirlwind" the "Wasp," the Curtiss, Packard (including the monster X-type 24 cylinder engine), the Fairchild-Caminez (the engine without a crankshaft or connecting rods), and other leading makes, including some of the foreign makes of engines.

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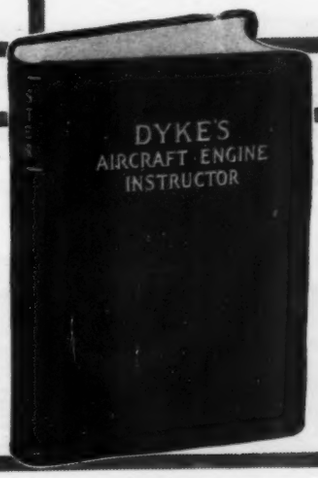

Partial Contents

Wright "Whirlwind" Aircraft Engines
"Wasp" Aircraft Engines
Curtiss Aircraft Engines
Packard Aircraft Engines
Fairchild-Caminez Cam Type Drive
Miscellaneous Aircraft Engines
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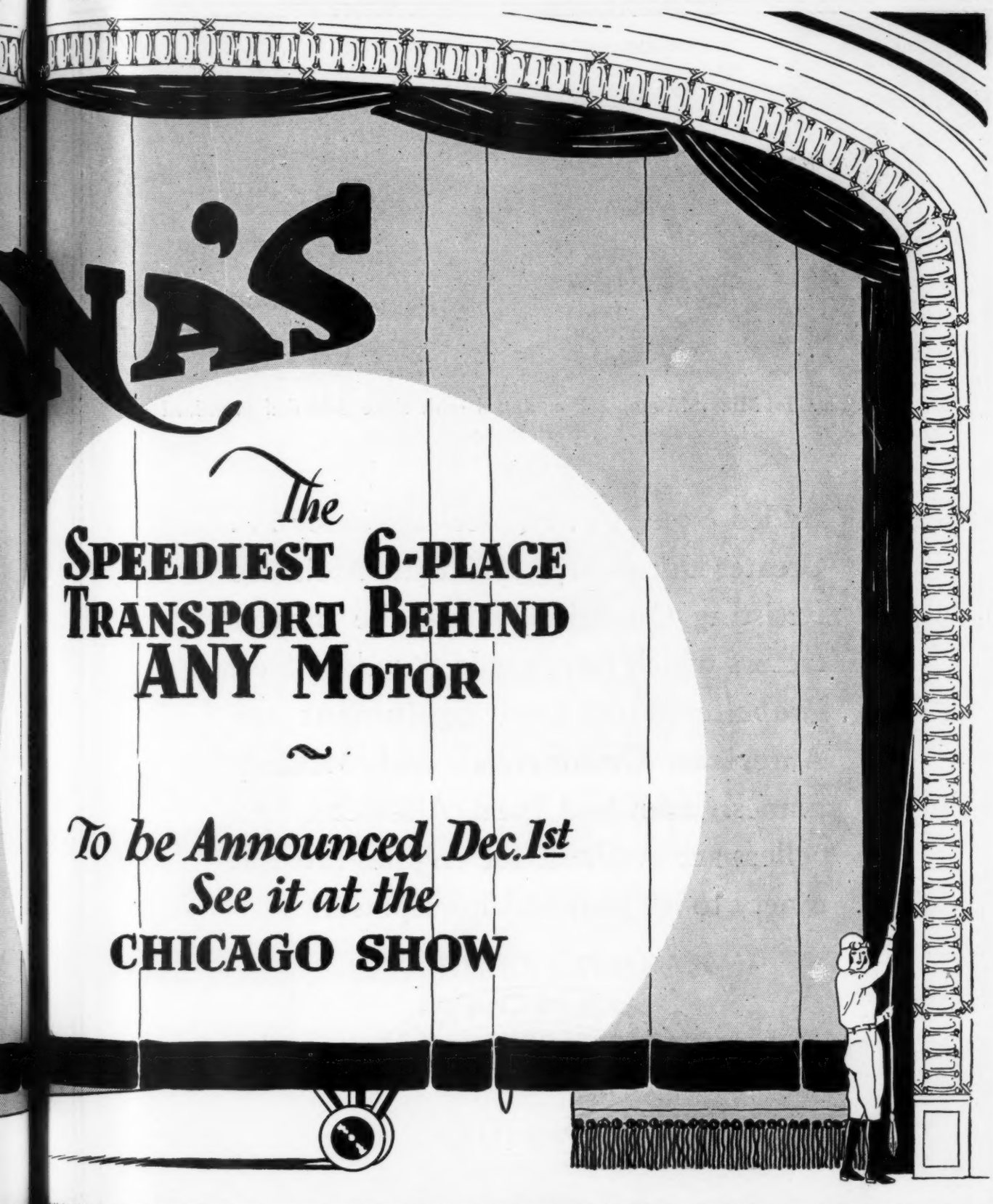

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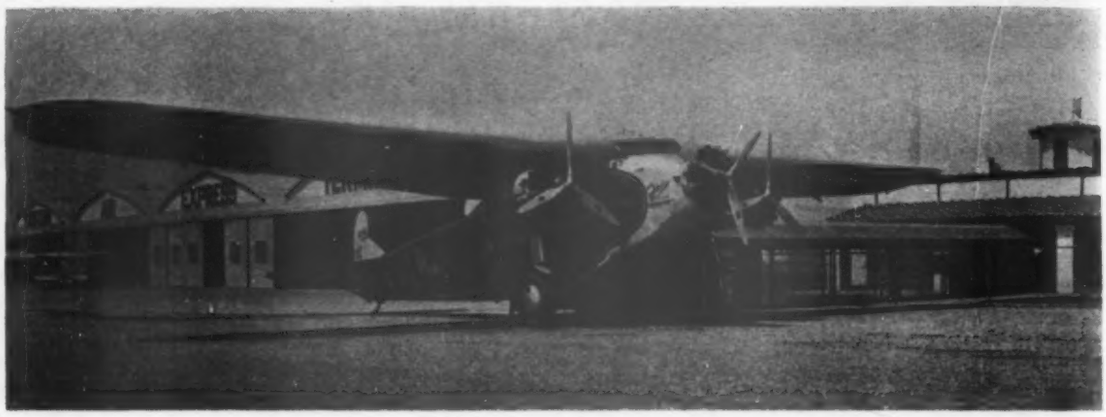

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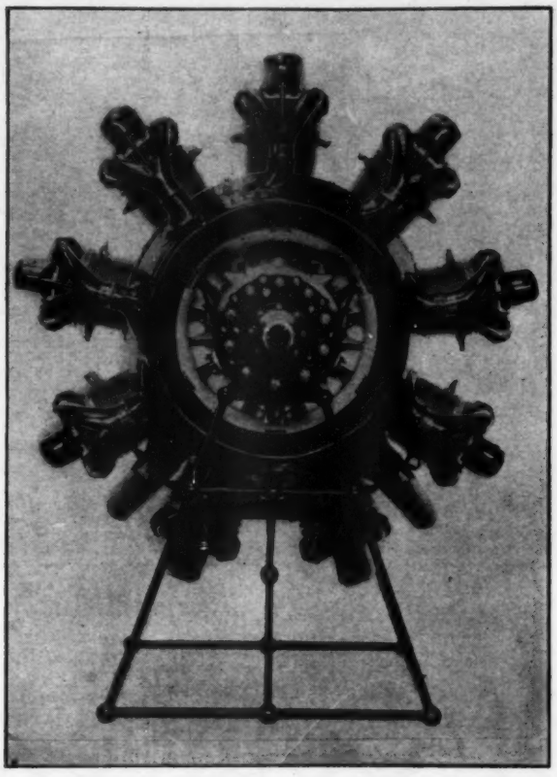

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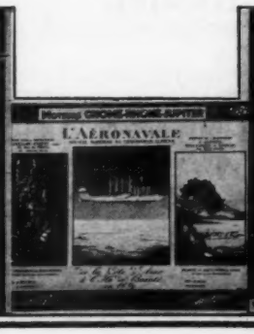

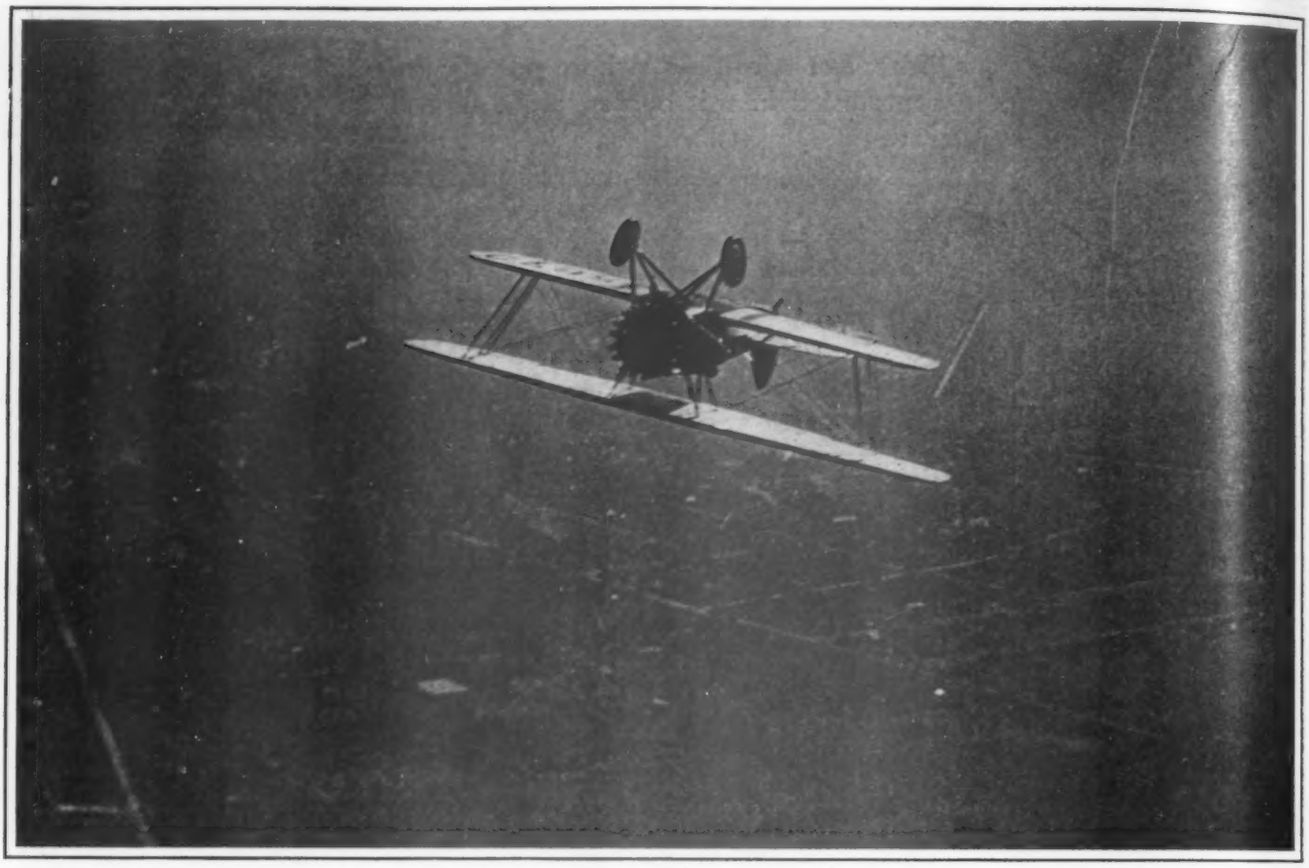

A Sport Waco in inverted flight

Of Course...

... you may never feel the urge to fly your Sport WACO like this. Still, it's great to know you have a plane that *can* do it. We show this picture, not to advocate stunt flying, but to emphasize the safety and strength and versatile adroitness of a strictly commercial WACO model.

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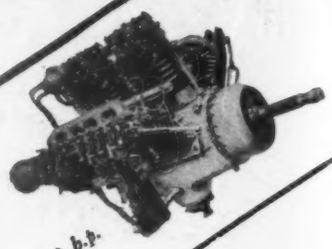

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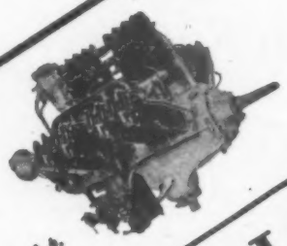

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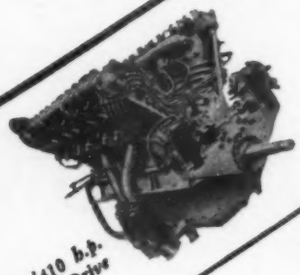

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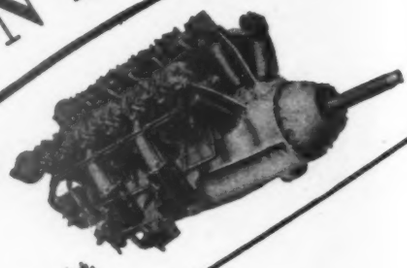

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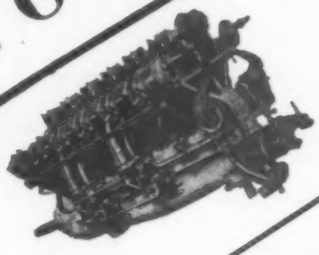

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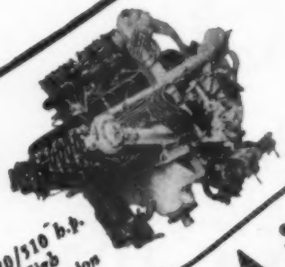

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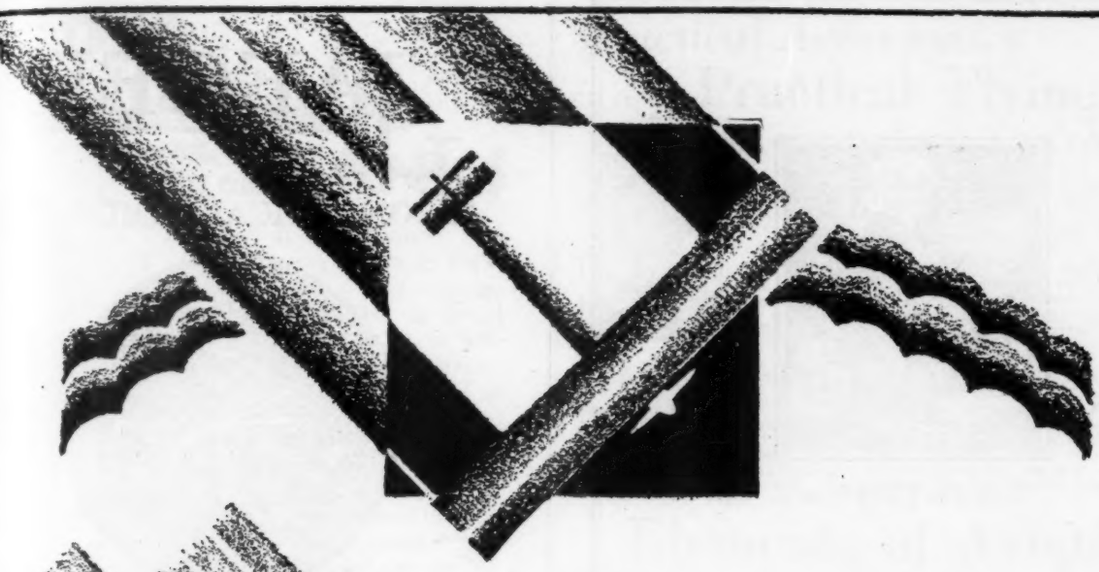

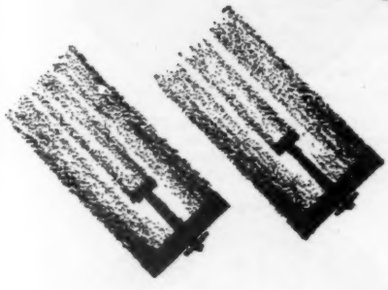

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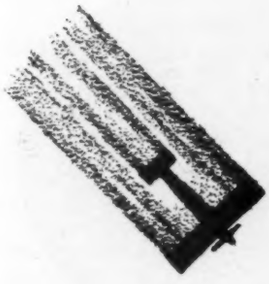

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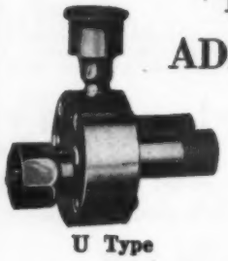

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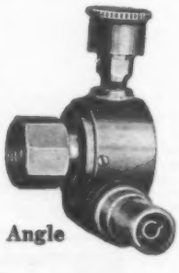

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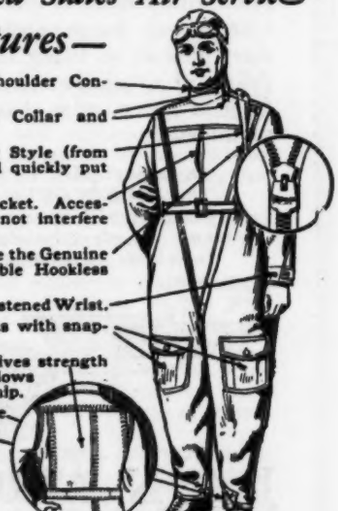

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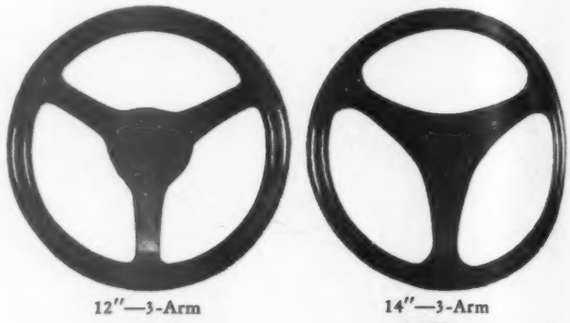

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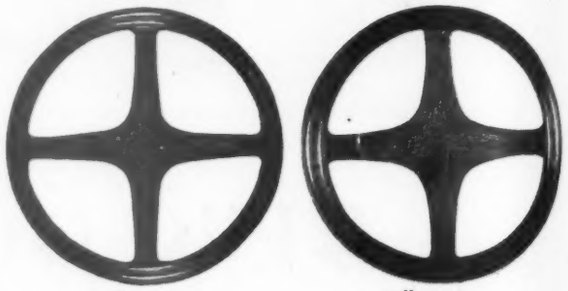

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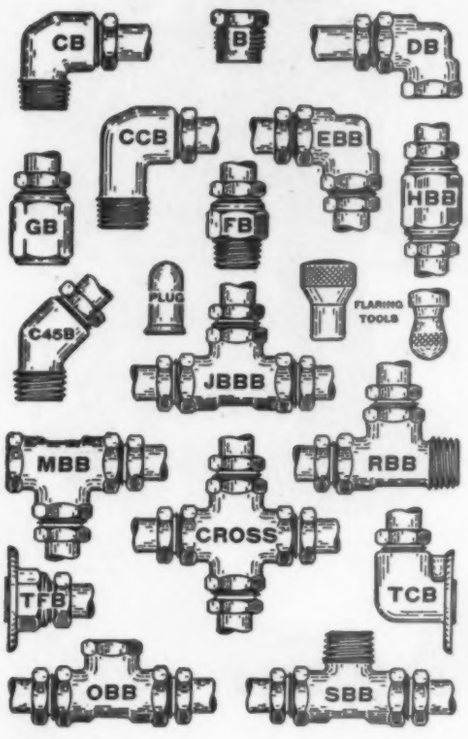

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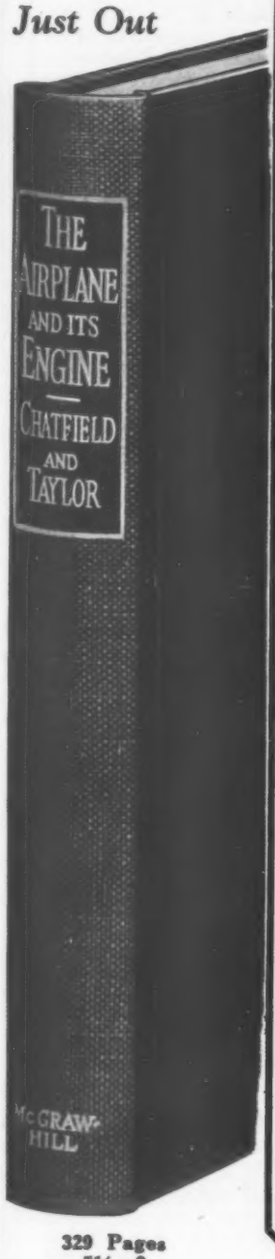

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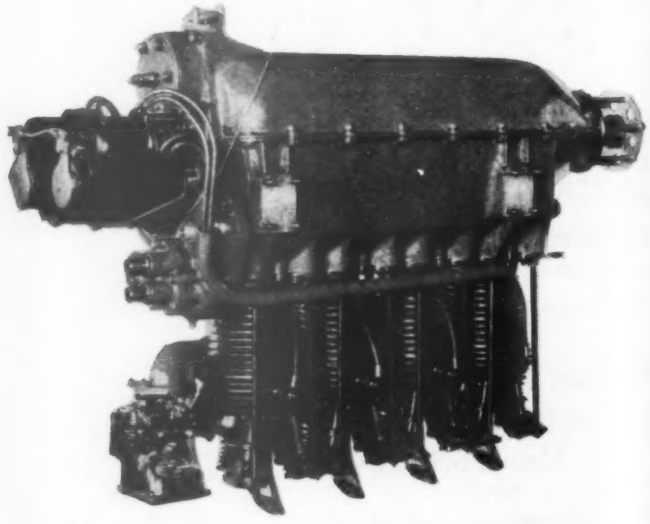

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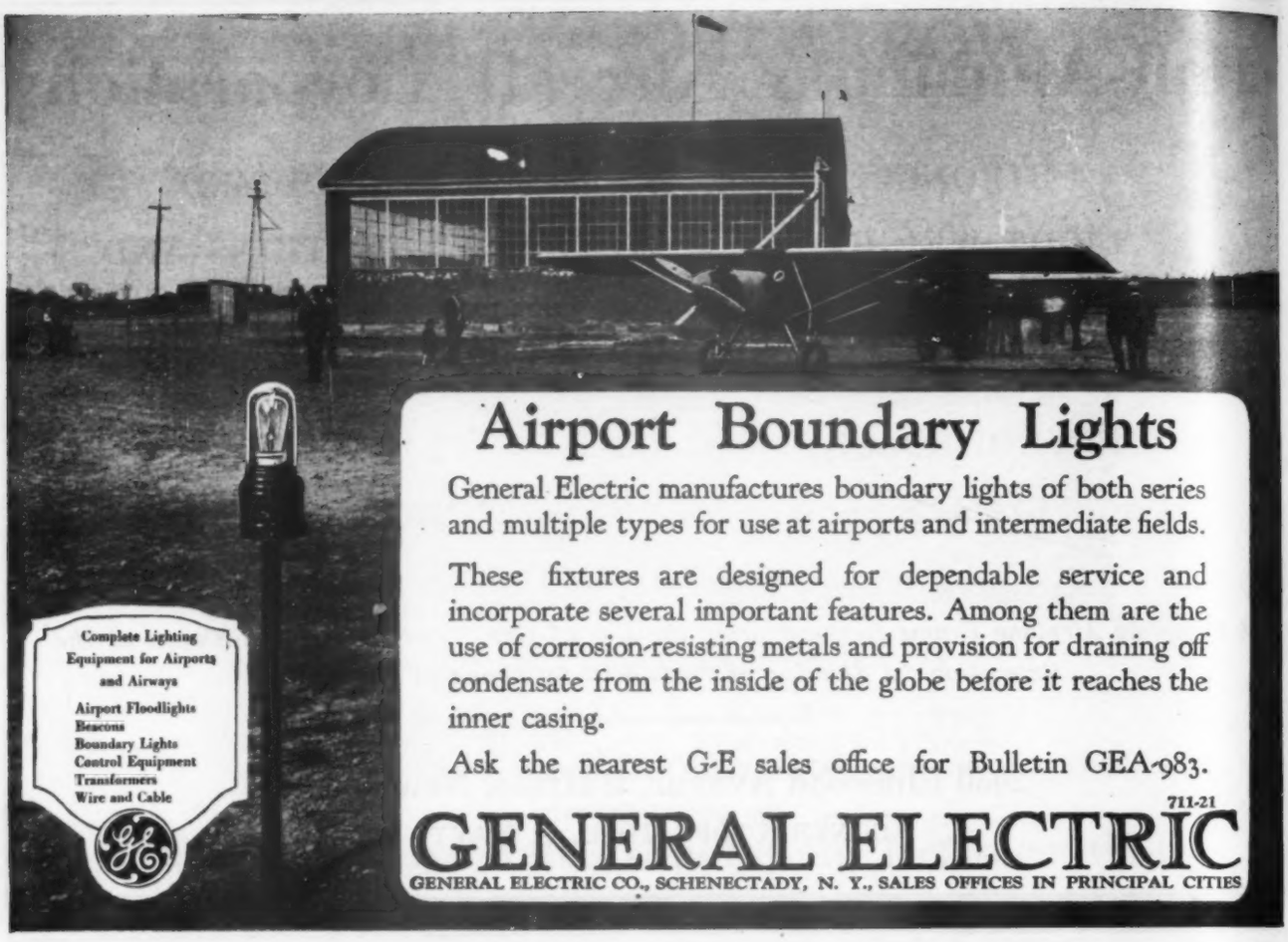

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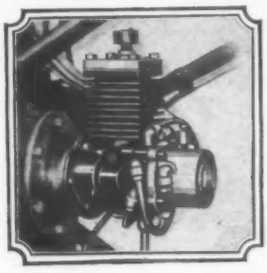

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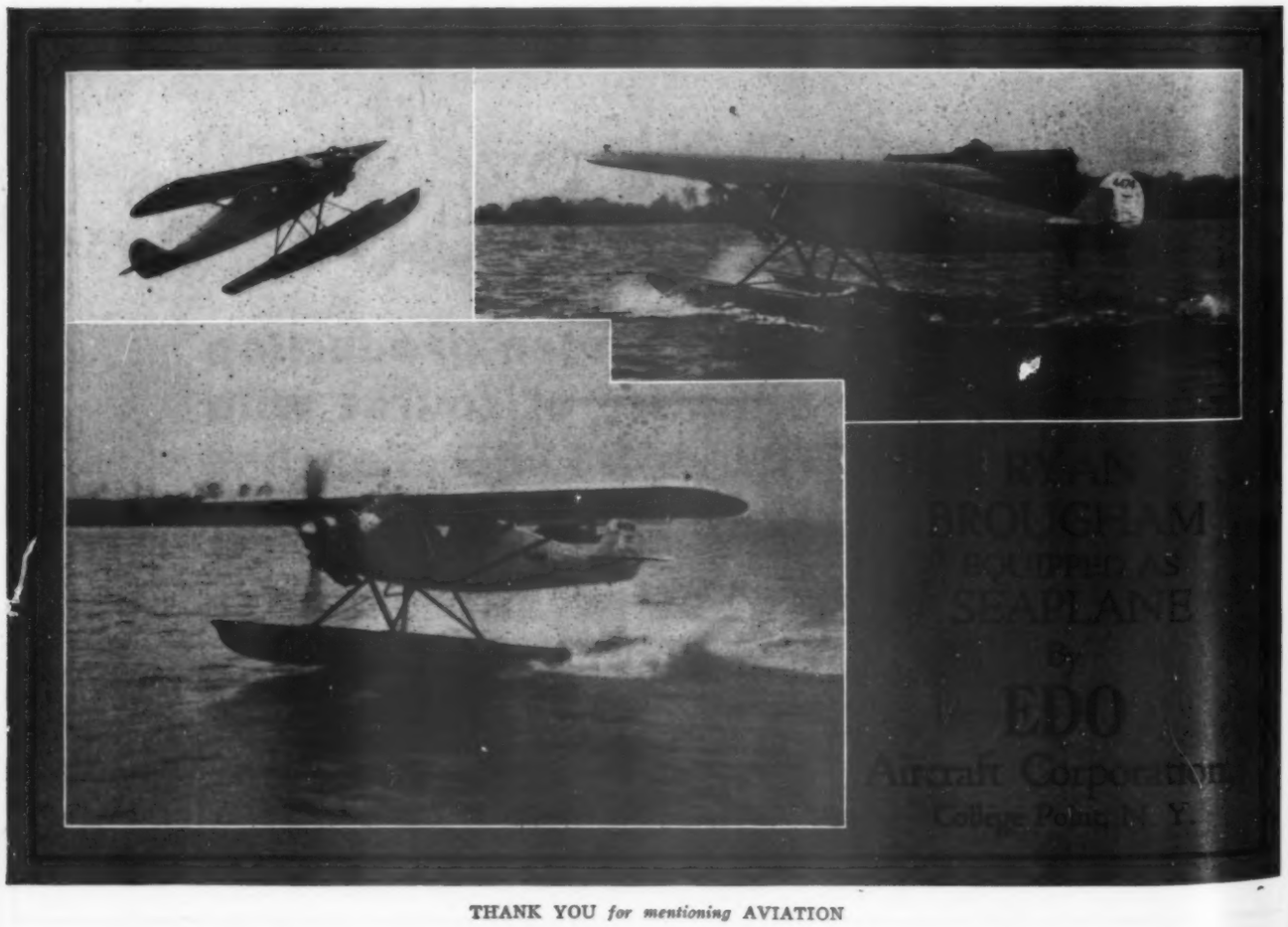

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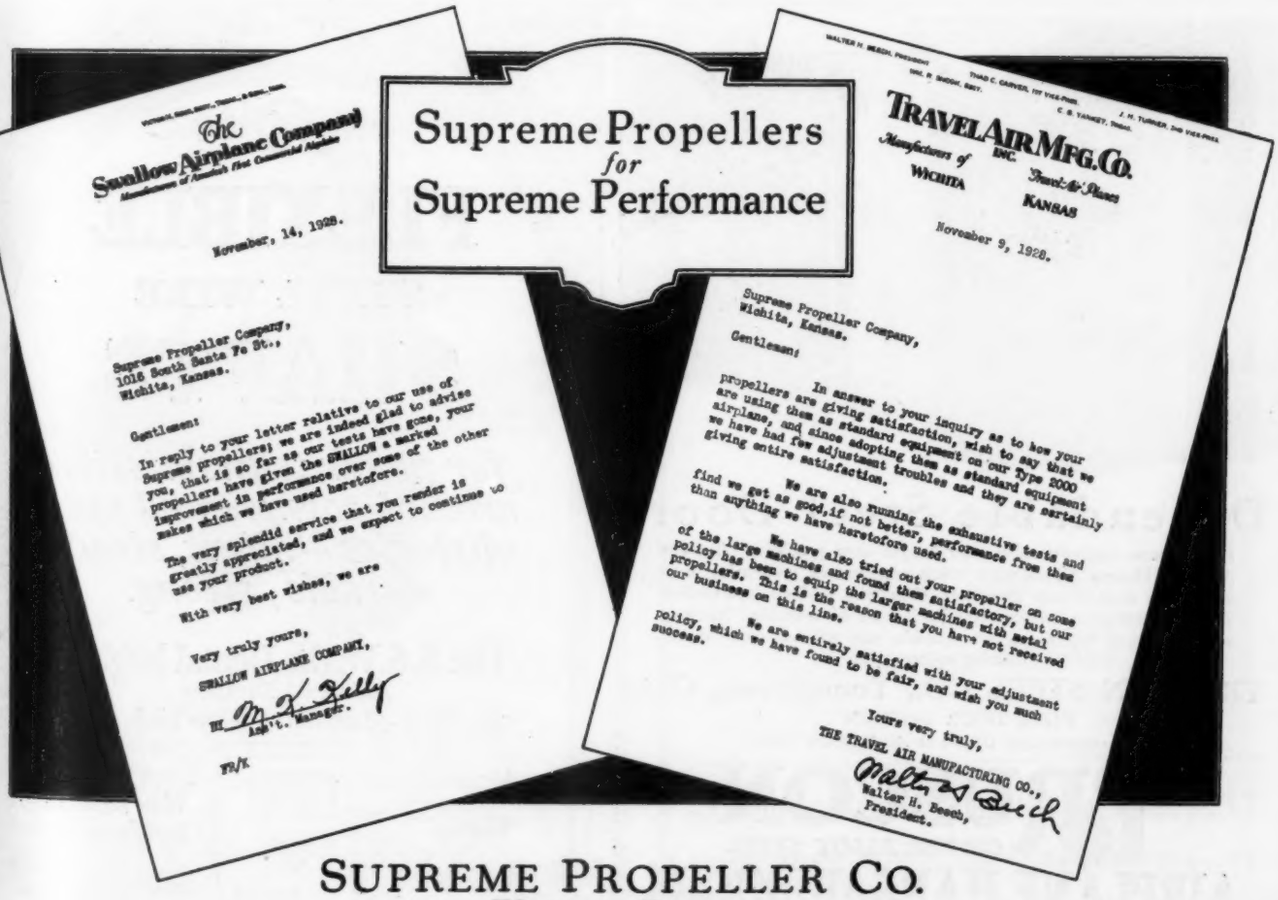
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With very best wishes, we are
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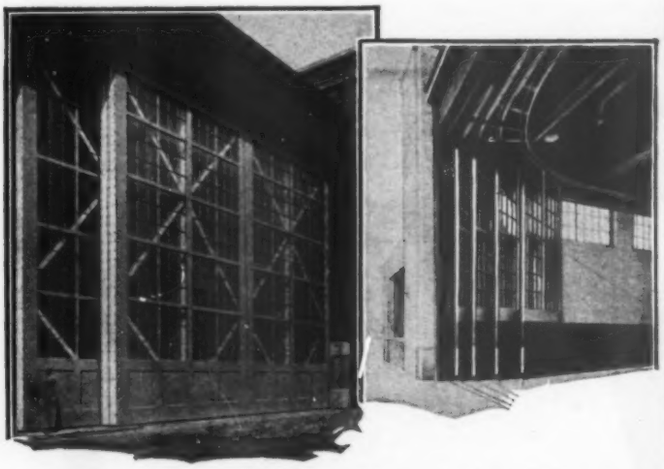

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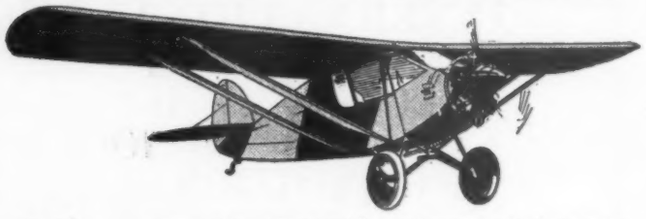

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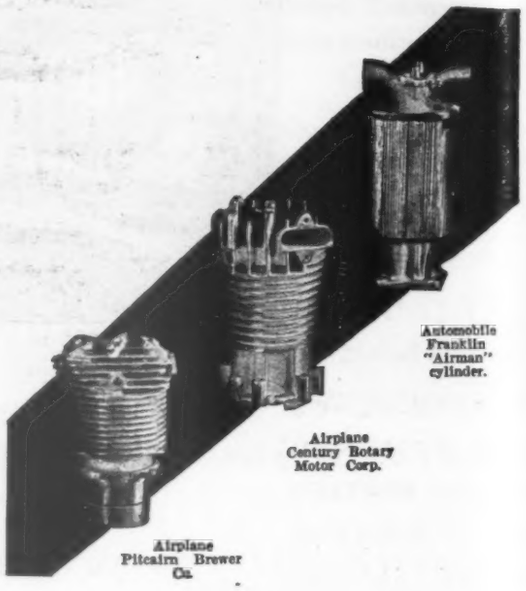

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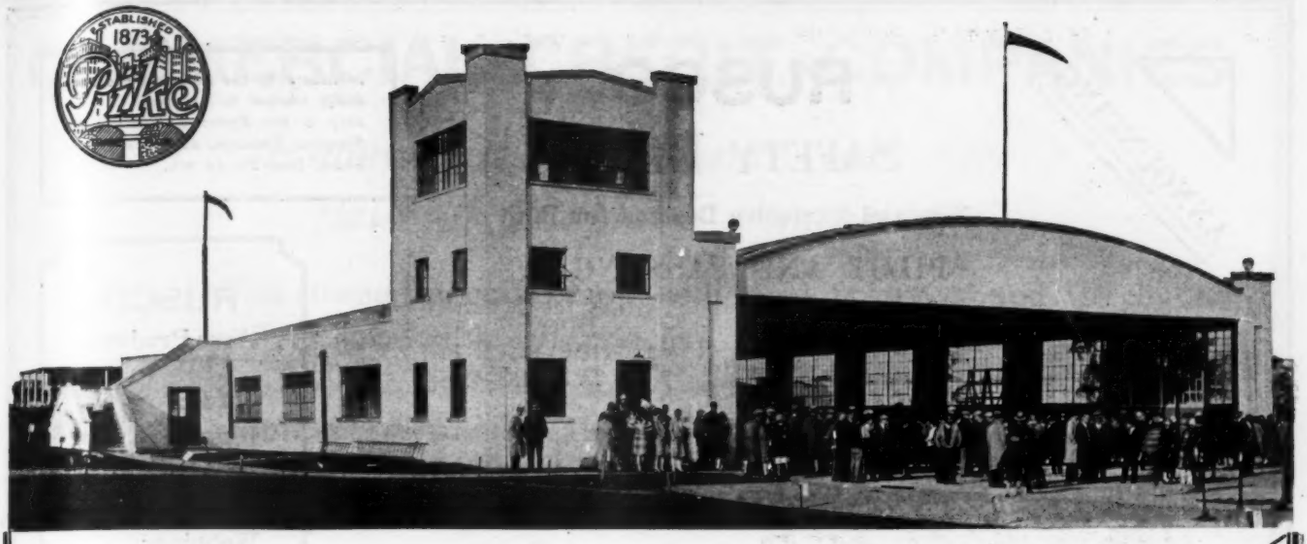

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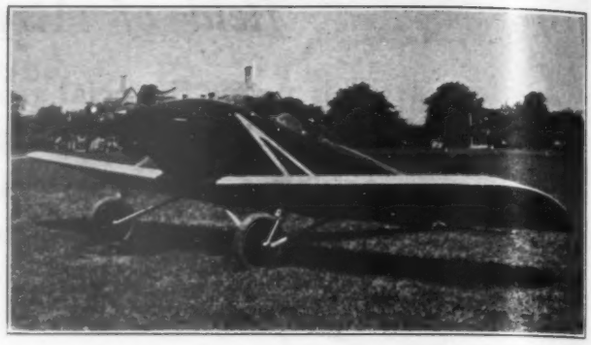

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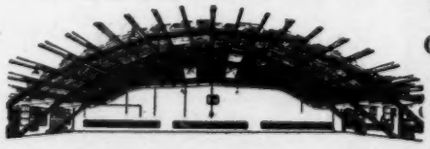

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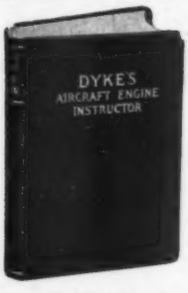

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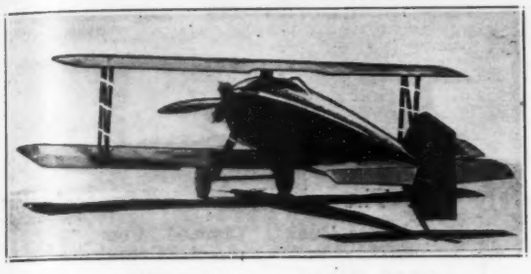

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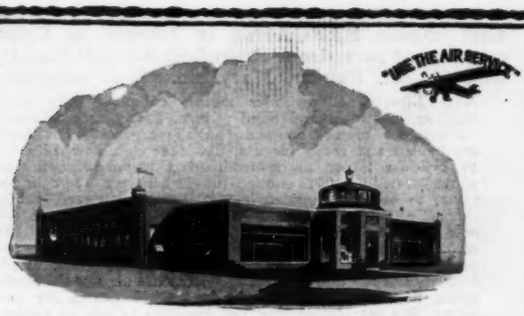

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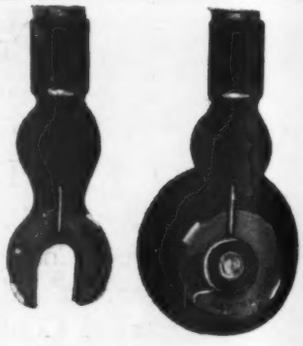

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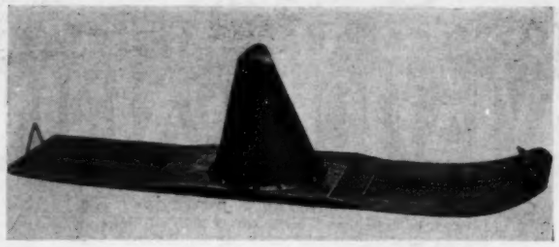

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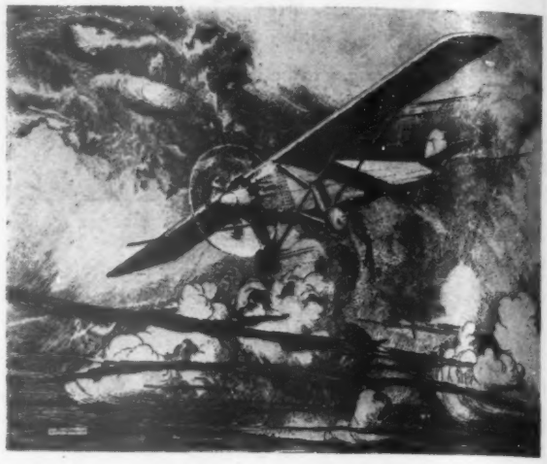

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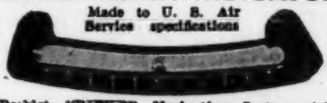
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NEW BURD piston rings for OX-5, 10c each. Brand new Hispano Stromberg carburetors, complete, $55.00; new type extra strength ribbed wrist pins for OX-5, $1.00; OXX-6, $1.00; Hispano, $1.00; new Berling OX-5 magnetos, $60.00. Gasoline level gauges, $2.50 any depth. Dixie converted booster magnetos, $7.50. Air Transport Equipment, Inc., Carle Place, N. Y.

FOR SALE or exchange for Waco or Travel Air or Eaglerock, three new OX-5 motors in original crates. What have you E. A. Forner 503 Madison St., Jackson, Mich.

WOULD SELL part interest in Eaglerock, also Avro. Both almost new. Going south for winter. Here's best chance to learn to fly. Seven hours of instruction guaranteed for only $30.00. Latshaw Aircraft, Clarion, Mich.

FOR SALE: Air mail DH with Allison rebuilt Liberty engine with steel back bearings, stub tooth gears. Cost $700.00 to have engine rebuilt. Extra new Ford Liberty engine and complete set of spare parts to build up another engine. Two propellers, one Curtiss Reed and one wooden. Spare wheels and tires. Ship converted for photographic work. Will sell everything $2,500.00 cash. Indianapolis Aviation Co., Indianapolis, Ind.

HEAVIER MAIL loads necessitating larger equipment release for immediate cash sale. Fokker J5 Universal—Boeing J4 training—Travel Air J4 three-place---Wright motor parts---Miscellaneous equipment---Steel and wood propellers. Price on request. Pacific Air Transport Inc., Oakland, Calif.

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FREE COMPLETE primary and advanced flying course with any new or used Waco purchased. Buy now and be prepared with sufficient flying for cash returns when spring arrives. Robbins Flying Service, Waco Distributors, Akron, Ohio.

WACO 9, $1,250.00. Terms. Super Swallow, $1,500.00. Travel Air, 12 hours, $2,500.00. Cessna four passenger monoplane, $3,750.00. New Lincoln sport plane, Henderson motor, $650.00. Terms. Pyrene fire extinguishers, unfilled Army surplus, as they are, $1.00 each. Gnome 50 hp. motor, $125.00. Complete set glider blue prints with specifications, $3.00 set. Wrist aeroplane compasses, $1.50 each. Midway Aero Co., P. O. Box 283, St. Paul, Minn.

MODEL A Hispano material: one upper and two lower crankcases; not cracked or welded; one starter mounting assembly; eight pistons; six new Ex. valves; 12 used valves; one oil pump shaft with vanes and crankcase sleeve complete; 100 new compression piston rings; two water inlet manifolds; two magneto drive housings; one model I magneto drive mounting assembly. Will sell lot for $185.00 and warrant all material in good serviceable condition. Air City Airways, Sturtevant, Wis.

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WRIGHT WHIRLWIND complete motor in bad condition, to be used for instruction purposes in aviation mechanics course. Riley Burrows, Hugoton, Kans.

WANTED: MODEL E three-place Hisso standard. Must be in fine condition. Give full details in first letter. Douglas Livingston, Portsmouth, N.H.

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WANT USED OX-5 new production ship less motor. Must be cheap for spot cash. Answer Geo. H. Mason, 526 Church Ave., S. W., Roanoke, Va.

WANTED: A Spad less motor, otherwise complete and sound. Fabric and location immaterial if priced right. What have you? J. M. Miller, R. F. D. 2, Poughkeepsie. N. Y.

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TRANSPORT PILOT, American, 30, married. Instructor of instructors Royal Flying Corps. Brilliant record as safe pilot. Broad business training, capable, industrious. Thorough gentleman. Character unquestionable. Consider connection only with responsible individual or organization. Everitt Fisher, Tabor, N. J.

PILOT WITH 6,000 hours—3,500 in U. S. Air Mail—1,500 at night. Thoroughly familiar all branches service. F.A.I. license, 1918. Executive sales experience dealing mechanical and operations department railroads. Two years law. Captain Air Service France test pilot, one year. Age 33, married, invites correspondence relative any capacity that shows real opportunity for future. Address "Executive," care AVIATION.

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WANTED: By major mail contractor—pilot with cross country night and bad weather flying experience. Those with less than 2,000 hours flying on larger equipment need not apply. Steady employment. Good salary. Box 1091, AVIATION.

SALES MANAGER for aerial photographic survey company established nine years. Previous experience in this line essential. Good position for right man. Reply giving full particulars and references. Box 1099, AVIATION.

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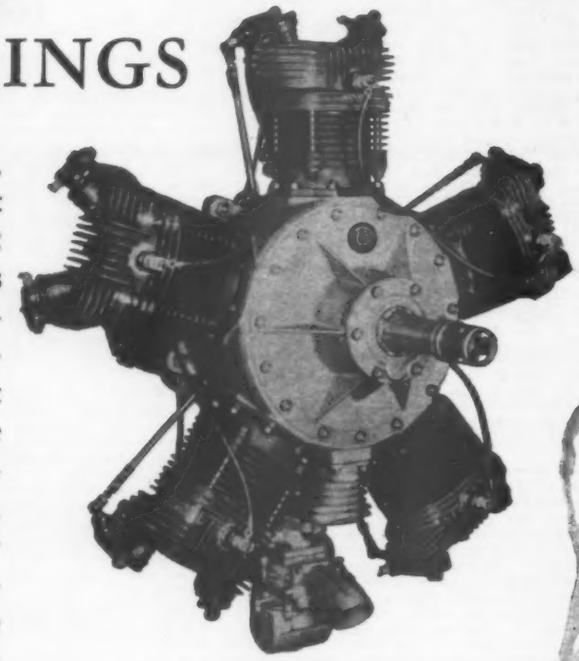
THE Velie 5-Cylinder, radial, air-cooled engine is rated at 45 H.P. at 1750 R.P.M. and 62 H.P. at 2000 R.P.M., and is equipped with SRB Ball Bearings at the three important positions—two main crankshaft bearings, and the third on the front end of the crankshaft taking the entire propeller thrust.

Velie engineers, like many other builders of aircraft engines, have absolute confidence in the ruggedness and reliability of SRB, "The Aeronautical Ball Bearing."



Powering the new, two place enclosed Velie Monocoupe, this Velie engine is giving a highly satisfactory performance.

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MANUFACTURERS' SPECIFICATIONS ON AMERICAN COMMERCIA

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT *AVIATION* DO

This table will appear monthly and correcti

MANUFACTURER	Designation	Price of Plane at Factory	Type	No. of Seats	Make of Engine	Total Rated HP.	Make of Propeller	Span	Wing Area (Sq. Ft.)	Length Overall	Height Overall	Weight Empty (Lb.) With Water if Water Cooled Engine is Used	Pay Load (Lb.)	Disposable Load (Lb.)	Normal Gross Weight Loaded (Lb.)	P Lo High Speed in M.P.H.
Advance Aircraft Co.	Waco 10	$5,535	OBL	3	Sh12	125	H,Hz,SS	30'7"	286	23'9"	9'	1330	370	800	2025	107
Advance Aircraft Co.	Waco 10	$2,035*	OBL	3	OX5	90	Hz	30'7"	286	23'6"	9'	1225	360	800	2025	96
Advance Aircraft Co.	Waco 10	$2,585*	OBL	3	E	150	H,Hz,SS	30'7"	286	23'6"	9'3"	1508	600	1092	2600	115
Advance Aircraft Co.	Waco 10	$7,341	OBL	3	J5	200	H,Hz,SS	30'7	286	22'6"	9'3"	1550	600	1050	2600	135
Aero-Craft Mfg. Co.	Aero-Coupe	$5,800	SBL	3	W	110	F	32'	250	24'	8'6"	1100	550	100	2100	11
Alexander Aircraft Corp.	Eaglerock A-1	.....	OBL	3	J5	200	.....	36'8"	330	24'11"	9'11"	....	....	....	2491	130
Alexander Aircraft Corp.	Eaglerock A-2	$2,250*	OBL	3	OX5	90	.....	36'8"	330	24'11"	9'11"	....	....	....	2442	100
Alexander Aircraft Corp.	Eaglerock A-4	.....	OBL	3	E	180	.....	36'8"	330	24'11"	9'11"	....	....	....	2618	121
American Eagle Aircraft Co.	.... ..	$2,985	OBL	3	OX5	90	H, Hz	30'	300	24'6"	8'4"	1227	840	830	2057	101
Atlantic Aircraft Corp.	F-7 & C-2	$14,500	CML	10-12	3-J5	600	H	63'3"	630	49'2"	12'9"	5480	2000	3720	9060	122
Atlantic Aircraft Corp.	Universal	$14,200	CML	5-7	J-5	200	H, Hz	47'9"	341	33'	8'9"	2100	1200	1900	4000	118
Atlantic Aircraft Corp.	Super-Univ	$19,340	CML	6-8	P Ww	400	SS	50'6"	382	36"	8'11"	2800	1230	2200	5000	140
Atlantic Aircraft Corp.	Fokker F-10	$60,000	CML	14	3-PWw	1200	SS	71'2"	728	50'8"	12' 5"	7200	2640	4950	11500	148
Arrow Aircraft Corp.	Arrow-Sport	$2,257	OBL	2	LB	60	. .....	25'6"	178	19'2"	6'11"	524	....	450	974	105
Bach Aircraft Co.	Air Yacht	$31,800	CML	10-12	2Sh12-pww	650	2 Sty,SS	52'	412	36.1	9'6"	3300	....	3200	6500	150
Bellanca Aircraft Corp.	CH	$14,500	CML	6	J5	200	Hz	44'4"	273	24'9	8 6	1850	2229	3284	5134	12
Berliner Aircraft Co.	CM4	$3,290	OML	3	OX5	90	H,Hz	36	219	25'10"	8	1400	....	900	2300	105
Berliner Aircraft Co.	CM5	$8,950	OML	3	J5	200	SS	36'	219	25'10"	8'	1675	....	1025	2700	13
Bird Wing Commr. Airplane Co.	No. 6	$2,795	OBL	3	OX5	90	Hz	31'4"	303	23'6"	8'7	1236	550	1019	2255	90
Boeing Airplane Co	40-B	$24,500	SBL	3	P Wh	400	H M	44'2"	545	33'4"	11'8"	3543	1428	2536	6079	13
Boeing Airplane Co.	40-C	$22,500	SBL	5	P Ww	500	H M	44'2"	545	33'4"	11'8"	3522	1445	2553	6075	129
Boeing Airplane Co.	B-1E	$18,500	CBF	6	P Ww	400	H W	39'8"	545	32'6"	12'	3090	750	1460	4550	115
Boeing Airplane Co.	B-1D	$15,000	CBF	4	J5	200	.. ..	39'8"	466	30'9"	12'	2412	720	1000	3442	95
Bourdon Aircraft Corp.	Kitty-Hawk	.....	OBL	3	Sh11	96	W	28'	233	21'11"	8'6½"	1115	....	....	1888	110
Breese Aircraft Co.	.....	.....	CML	6	J5	200	SS	41'	260	27	10'6"	155	....	1000	2550	120
Brown-Mercury Aircraft Corp.	C-3	19,800	CML	3	3-A6	180	Sty	41'6"	260	25'	.....	1450	600	1500	2950	120
Buhl Aircraft Co	Airsedan-C5A	$13,500	CBL	5	J5	200	SS	42'	334	28	10'	2072	1000	1628	3700	120
Buhl Aircraft Co.	Airsedan CA-3C	$12,000	CQL	3-4	J5	200	M	36'	240	28'	8'6"	1800	655	1400	3200	139
Buhl Aircraft Co.	Junior Airsedan	$8,000	CQL	3	W	110	M	36'	240	25'	8'6"	1500	520	1000	2500	110
Cessna Aircraft Co.	3-120	$5,750	CML	3	A	120	H Hz	40'6"	224	23'8"	7 4	1250	480	750	2000	125
Cessna Aircraft Co.	4-125	4,075*	CML	4	Sh12	125	H Hz	40'6"	224	23' 8	7 4	1260	760	1030	2286	12
Cessna Aircraft Co.	4-200	$9,800	CML	4	J5	200	H Hz	40'6"	224	23' 8	7 4	1350	800	1070	2420	150
Command Aire Inc.	Comm'd-Aire	$2,450*	OBL	3	OX5	90	H	31'6"	300	24'6"	8'	1275	375	800	2075	104
Command Aire Inc.	Heinkel H.D. 40	$25,000	CBL	2	PWw	400	M	57'	250	39'	14'	3100	2500	4400	....	140
Crawford M. & A. Mfg. Co.	A1	$1,500	OML	2	LR	80	own	30'	150	17'9"	7'	950	....	450	1400	9
Crown Motor Carriage Co.	B3	.....	OBL	2-3	K-5	100	S	28'6"	236	21'3"	8'5"	850	330	700	1500	110
Curtiss-Robertson Airplane Mfg. Co.	Robin	$4,000	CML	3	OX5	90	Hz	41'	245	25'9"	7 10"	1489	328	728	2217	101
Driggs Aircraft Corp.	Dart II	$1,900	OBL	2	A3	35	Hz	28'	140	19'6"	6'	450	...	370	820	85
G. Elias & Bro. Inc.	Aircoupe	$3,350	CML	2	A	80	Elias	28' 1½"	192	21'	7'2"	870	518	564	1334	96
Fairchild Airplane Mfg. Co.	FC-2W2 land	.....	CML	5	P Ww	400	SS	50'	332	32'10"	9'4"	2781	....	2719	5500	140
Fairchild Airplane Mfg. Co.	FC 2 land	.....	CML	5	J5	200	CR	44'	290	30'11"	9'	2150	845	1456	3650	122
Federal Aircraft Corp.	CM-1	$12,500	CM	5	J4B	200	We	37'6"	262	29'3"	9'	2080	630	1395	3475	125
Gates-Day Aircraft Corp.	GD-24	$5,200	OBL	5	E	180	H	45'	350	26'	11'	1700	800	1300	3000	115
Gulls Aircraft Corp.	Crusader	.....	CBL	4	Sh12	125	Hm	32' 9	245	23'	8'1"	....	....	...	2400	110
Hamilton Metalplane Co.	H-45	.....	CML	8	PWw	400	H	54'5"	390	34'	9'	3100	....	2300	5100	135
Hamilton Metalplane Co.	H-47	...	CML	8	PWh	500	H	54'5"	390	34"	9'	3200	....	2450	5650	140
Heath Airplane Co.	Parasol	$695	OML		H	23	own	23'	94	16'9"	5'11"	290	....	225	515	70
International Aircraft Corp.	F-17	$2,950	OBL	3	OX5	90	H	35'	325	25	9'6"	7480	320	620	2100	100
International Aircraft Corp.	F-18	$12,250	CBL	6	J5	200	SS	37'	360	27'6"	10'6"	2200	950	1550	3750	125
Irland Aircraft, Inc.	Neptune	$14,600	CMA	5	J5	200	CR	40	350	31'6"	11'6"	2250	750	1358	3608	95
Irwin Aircraft Co.	M-T-2	$1,165	OBL	1	179	25	own	20'	105	13'6"	5'9"	275	100	300	575	90
Keystone Aircraft Corp.	Pronto	.....	OBL	3	J5	200	.....	39'11"	365	26'9"	.....	1975	....	1310	3285	112
Keystone Aircraft Corp.	Pathfinder	.....	CBL	12	3-J5	600	.....	66'6"	1150	46'	.....	6536	1900	4481	10841	112
Kinner A. & M. Co.	Courier	.....	OML	2	K-	100	SS	35'	216	23'	7'	915	....	550	1465	120
Kolder-Reisner Aircraft, Inc.	Challenger	$2,400*	OBL	3	OX5	90	Hz, H	30'1"	285	23'9"	9'4"	1200	412	811	2000	102
E. M. Laird Airplane Co.	Commercial	.....	OBL	3	J5	200	SS	34'	300	23'6"	9'3"	1550	800	...	...	130
Laird Aircraft Corp.	Whippoorwill	.....	CBL	4	J-5	200	.....	36'	351	27	9	1650	....	1000	2650	125
Lincoln Aircraft Co.	Lincoln-Page	.....	OBL	3	OX5	90	.....	32'	300	.....	.....	1200	450	1000	2200	100
Lockheed Aircraft Co.	Vega	.....	CML	5-7	J5	200	SS We	41'	275	27'5"	8'6"	1650	1000	1550	3200	135
Lockheed Aircraft Co.	Air Exp.	.....	CML	5-7	P Ww	400	SS	41'	275	27'5"	8'6"	1850	1000	1845	3645	167
Loening Aeronautical Engr. Corp.	Cabin Amphibian	$26,700	CBA	5-7	PWw	400	SS	45'	504	34'8"	13'2"	3400	1200	2000	5400	120
Mahoney-Ryan Aircraft Corp.	Ryan B1	$12,200	CML	5	J5	200	H W	42'	290	27'5"	9'10"	1870	800	1430	3300	126
Metal Aircraft Co.	Flamingo G-1	.....	CML	6-8	PWw	400	SS	48'	354	30'	9'	2800	....	2050	4850	140
Mono Aircraft Inc.	Monocoupe	$2,675	CML	2	V	45	Hz	30'	158	19'6"	6'3"	700	....	475	1175	90
Mohawk Aircraft Corp.	Pinto	$2,375	OML	2	A	60	...	30'6"	124	22'	6'3"	725	....	500	1225	110
National Airways System, Inc.	Air King	$2,395	OBL	3	OX5	90	Hz	34'1"	310	25'5	9'	1290	....	800	2090	103
Niles Aircraft Co	Williams	.....	OML	1	Sa	40	.....	26'	108	18	6'6"	440	....	....	....	85
Pheasant Aircraft Co., Inc.	H-10	$2,375	OBL	3	OX5	90	Hz	32'6"	283	23'6"	9'	1297	600	785	2082	100
Pitcairn Aviation Inc.	Mailwing	$10,000	OBL	1-3	J5	200	SS	33'	252	22'10"	8'10"	1612	600	770	2512	136
Pitcairn Aviation Inc.	Super Mailwing	.....	OBL	1-2	J5	200	.....	33'	262	22'10½"	9'3"	1840	....	1160	3000	128
Pitcairn Aviation Inc.	PA-4	.....	OBL	3	OX5	90	Hz	30'	226	21'10"	8'7"	1165	....	785	1950	101
Pruddon Aircraft Corp.	S E-1	$22,500	CML	8	PWw	400	SS	57'	427	38'	9'5"	3000	1260	2065	5065	114
Richmond Airways, Inc.	Sea Hawk	.....	OMF	5	C6	160	.....	46'	317	28'	.....	1700	....	1000	2700	95
Sikorsky Mfg. Co.	S-37	.....	CBL	18	2P Wh	1000	.....	100'	1049	45'6"	16'3"	8000	4060	7000	15000	122
Sikorsky Mfg. Co.	S-38 Amphibion	.....	CQA	10	2P Ww	800	SS, H	71'8"	720	40'3"	13'10"	6000	2210	4000	10300	125
Simplex Aircraft Corp.	Red Arrow	$3,950	CML	2	K5	100	Sty	33'4"	148	20' 3"	6'10"	1000	....	600	1600	125
Starling Aircraft Co.	.....	.....	OB	3	OX5	90	.. ..	32'	....	23'4"	9	1237	....	600	1837	104
Stearman Aircraft Co.	C-2-K	$6,740	OBL	3	Sh12	125	H, Hz	35'-28'	296	24'	9'	1285	350	865	2150	110
Stearman Aircraft Co.	C-2-R	$8,730	OBL	3	J5	200	H, CR	35'-28'	296	23	9'	1438	400	962	2400	130
Stinson Aircraft Corp.	SM-ID	$12,500	CML	6	J5	200	H	45'10"	292	32'	8'6"	2400	1340	2100	4500	125
Stinson Aircraft Corp.	Junior SM-2	$6,950	CML	4	W	110	Wd	41'6"	236	26'3"	7'9"	1510	593	990	2500	110
Spartan Aircraft Co.	C-3	$6,000	OBL	3	Wal	135	H	32'	293	22'11"	8'9"	1300	448	850	2150	115
Stout Metal Airplane Co.	4 AT	.....	CML	12	3J5	600	SS	74'	785	49'10"	12'8"	6200	2200	3800	10000	114
Swallow Airplane Mfg. Co.	Commercial	.....	OBL	3	OX5	90	.....	32'	300	24'	8'6"	1470	360	730	2200	100
Taylor Bros. Aircraft Co.	Chummy	$3,800	SML	2	K-5	100	.....	34'	175	22'	7'6"	950	160	550	1500	110
Texas Aero Corp.	Temple	.....	OML		J5	200	.....	39'4"	225	25'10"	8'3"	....	567	....	2250	..
Thaden Metal Aircraft Co.	T-1	.....	CML	7	P Ww	400	.....	53	....	35	11	2900	..	2200	....	...
Thunderbird Aircraft, Inc.	W-14-O	$2,950*	OBL	3	OX5	90	Sty	31'	278	24'8"	9'7"	1433	340	815	2248	114
Thunderbird Aircraft, Inc.	W-14-H	.....	OBL	3	E	150	Sty	31'	278	24'8	9'7"	1551	500	945	2496	135
Travel Air Mfg. Co.	2000	$2,950	OBL	3	OX5	90	H, Hz	34'8"	296	24'2"	8'9"	1350	350	750	2100	100
Travel Air Mfg. Co.	4000	$9,100	OBL	3	J5	200	H	34'8"	296	23'6"	8'9"	1600	600	1000	2600	130
Travel Air Mfg. Co.	6000	$13,000	CML	5	J5	200	SS, H	48'7"	282	31'8½"	18'8½"	2175	944	1625	4100	128
Travel Air Mfg. Co.	9000	.....	OBL	3	Sh12	125	W	34'8"	296	24'2"	8'9"	1250	360	960	2210	105
Wallace Aircraft Co.	Touroplane	$2,500*	CML	3	A	80	Hz	37'	205	23'6"	7'6"	850	320	650	1500	95
Whites Aircraft	Hum. Bird	$2,150	OBL	3	OX5	90	Hz	33'1"	318	23'6"	8'3"	1050	450	850	1900	97
Western Airplane Corp.	King Bird	$2,500	OBL	3	OX5	90	Hz	35'	320	25'4"	9'	1200	600	800	2000	95
Zenith Aircraft Corp.	Albatross	$35,000	CML	14	3-Sn12	375	Sty.	90'	1032	50'	12'6"	4000	5000	7000	2.000	100

TYPE:
A—Amphibian
B—Biplane
C—Closed
F—Flying boat
L—Landplane
M—Monoplane
O—Open
Q—Sesquiplane
S—Semi-closed
W—Seaplane

ENGINE: One engine unless stated in italics.
A—Ansani
C6—Curtiss
E-Wright Hispano-E
FC—Fairchild Caminez
H—Henderson
I79—Irwin
J5—Wright Whirlwind
K—Kinner
L—Liberty
LB—Le Blond
LR—LeRhone
OX5—Curtiss
P Wh—Pratt & Whitney Hornet
P Ww—Pratt & Whitney Wasp
SR—Super Rhone
SH—Siemens Halske
Sa—Saekaly
V—Velie
Wal—Walter
W—Warner
*—Price without engine

PROPELLER:
CR—Curtiss Reed
H.—Hamilton
Hz—Hartzell
M—Metal
Sty—Story
SS—Standard Steel
W—Wood
We—Westinghouse

FUSELAGE
B—Bolted
Cor.—Corruga
D—Duralumin
F—Fabric cover
Mon—Monocoq
O—Open section
BRAKES:
B—Bendix
Ex—Extra
H—Hydraulic

RCIAL AIRPLANES AND SEAPLANES AS COMPILED BY *AVIATION*

***ION* DOES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN**

nd corrections and suggestions are invited.

Performance With Full Load at Sea Level As Supplied by Manufacturers.																			
High Speed in M.P.H.	Cruising Speed in M.P.H.	Landing Speed in M. P. H.	Climb at Sea Level in F.P.M.	Climb to 10'000 in Minutes	Service Ceiling in Feet	Fuel Capacity in Gallons	Normal Range in Miles	Normal Fuel Consumption at Cruising Speed Gal. Per Hr.	Fuselage Construction	Wing Construction	Are Wings Wired for Lighting?	Type of Control	Brakes	Type of Shock Absorber	Type of Pontoon Provided for	Additional Cost a Seaplane	Dept. of Commerce Type Certificate Number	Performance Figure Guaranteed?	
107	93	35	..	..	....	37	..	....	Wl-ST	Wd-F	Yes	SPD	Ex.	O-S	EFH	$1,100	26	....	Advance—Waco Siemens
96	85	35	..	..	13,000	48	450	8	Wl-ST	Wd-F	Yes	SPD	Ex	O-S	EFH	....	13	....	Advance—Waco OX—5
115	105	40	..	..	15,000	76	..	....	Wl-ST	Wd-F	Yes	SPD	Ex.	O-S	EFH	$1,100	42	....	Advance—Waco Hisso
135	118	40	1200	..	18,000	65	..	12	Wl-ST	Wd-F	Yes	SPD	Ex.	O-S	EFH	$1,100	41	..	Advance—Waco W—J—5
110	100	38	900		12,000	44	460	6.6	Wl-ST	Wd-F	Yes	SD	B	Arl	....	$1,000	Apl.	Yes	Aero-Craft—Coupe
130	..	39	1080	..	17,900	..	..	....	Wl-ST	Wd-F	....	SCD	....	RC	E	....	56	....	Alexander—Eaglerock A-1
100	87	34	514	..	11,500	46	435	10.3	Wl-ST	Wd-F	....	SCD	....	RC	E	....	7	Yes	Alexander—Eaglerock A-2
121	..	40	840	..	14,700	..	..	....	Wl-ST	Wd-F	....	SCD	..	RC	E	....	58	....	Alexander—Eaglerock A-3
101	85	30	575	45	12,000	42	425	7.5	Wl-ST	Wd-F	Yes	SPD	Ex	RAR	E	$990	17	Yes	AmericanEagle
122	100	55	720	24	12,500	185	530	32	Wl-ST	Wd-P	Yes	DeCD	Yes	RAR	..	....	Apl	....	Atlantic—Fokker F7 & C-2
118	98	48	500	40	11,500	78	600	12	Wl-ST	Wd-P	Yes	SCD	Yes	RC	M	$2450	9	....	Atlantic—Fokker Univ.
140	118	42	1000	15	18,000	120	700	20	Wl-ST	Wd-P	Yes	SCD	Yes	RAR	M	$3110	Apl	5%	Atlantic—Super Univ.
148	125	55	1400	10	18,000	286	580	60	Wl-ST	Wd-P	Yes	DeCD	Yes	RAR	....	....	..	....	Atlantic—Fokker F-10
105		36	680		15,200	..	..		Wl-ST	Wd-F	....	S	....	RC	....	....	..	....	Arrow—Sport
150	110	45	1100	12	18,000	170	500	32	Wd-P	Wd-F	Yes	DeCD	S-B	Hy-C	....	....	..	Yes	Bach—Air Yacht
125	110	46	850	..	13,000	92	800	10	Wl-ST	Wd-F	Yes	SCD	Yes	RC	D	....	47	....	Bellanca—CH
105	85	41	450	40	13,000	37	400	8	WEST	Wd-F	Ex.	SPD	Ex.	O-S	None	....	39	5%	Berliner—CM-4
130	110	45	..	..	..	60	550	12	Wl-ST	Wd-F	Ex.	SPD	B	O-S	None	....	Apl	5%	Berliner—CM-5
90	80	30	460	80	10,000	35	325	9	Wl-ST	Wd-F	Yes	SCFD	Ex.	RC	B	$990	Apl	Yes	Bird Wing—No. 6
132	..	57	830	16.5	15,100	140	..	25	Wl-ST	Wd-F	Yes	S	S	O	....	....	27	....	Boeing—40-B
129	..	57	600	25.3	12,000	140	..	20	Wl-ST	Wd-F	Yes	S	S	O	....	....	54	....	Boeing—40-C
115	..	59	1000	18.5	12,000	80	..	20	Wd	Wd-F	Yes	De	....	....	....	....	..	....	Boeing—B-1E
95	..	52	..	..	12,000	40	..	....	Wd	Wd-F	Yes	DeD	....	....	....	....	23	....	Boeing—B-1D
110	90	40	..	..	12,000	37.5	..	6.5	Wl-ST	Wd-P	....	SPD	....	RD	....	....	Apl	....	Bourdon Kitty Hawk
120	115	43	900	..	15,500	80	550	9.5	Wl-ST	Wd-F	....	....	....	RC	....	....	....	....	Breese
120	100	40	600	35	14,000	78	650	12	Wl-ST	Wd-F	Yes	SC	....	Grs.	No	....	Apl	....	Brown-Mercury—C-3
120	95	50	700	45	13,500	70	..	15	Wl-ST	Wd-F	Yes	SC	Yes	OS	Met	+2,500	33	....	Buhl Airsedan
139	115	45	900	15	14,000	90	700	14	Wl-ST	Wd-F	Yes	SP	Yes	OS	Met	$3,000	46	5%	Buhl Special Airsedan
110	90	40	600	25	11,000	..	600	7	Wl-ST	Wd-F	Yes	SP	Yes	OS	Met	$2,000	Apl	5%	Buhl Junior Airsedan
125	110	45-50	1000	..	....	42	400	10	Wl-ST	Wd-F	Yes	SPD	Ex.	RAR	....	....	Apl	5%	Cessna Aircraft Co.
12	11 5	45	100	.	....	4-	40	10	Wl-ST	Wd-F	Yes	SPD	Ex.	RAR	....	....	Apl	5%	Cessna Aircraft Co.
150	125	45-50	1400	..	....	42	400	12	Wl-ST	Wd-PF	Yes	SPD	Ex	RAR	....	....	Apl	5%	Cessna Aircraft Co.
104	85	36	550	..	10,000	..	400	....	Wl-ST	Wd-PF	Yes	S	No	RC	E	$1,100	53	....	Command-Aire
140	..	54	..	..	18,000	.	600	....	Wl-ST	Wd-PF	Yes	DeD	Yes	Arl	M	$2,000	..	5% N	Heinkel H.D. 40
9	64	47	.	.	18,00	40	500	6	ST-Wd	Wd-F	No	D		RC	....	....	No	5%	Crawford -A/
110	90	35	750	45	14,000	27	400	6	Wd	Wd-F	No	SD	No	Grs	....	....	Apl	Yes	Crown—B3
101	85	46	400	..	11,500	50	607	7	Wl-ST	Wd-FD	Yes	S-PC	No	RAR	....	....	40	5%	Curtiss—Robin
85	75	46	560	..	15,000	15	375	3	Wl-ST	Wd-FD	Yes	SC	No	PAR	None	....	15	5%	Driggs—Dart II
96	80	25	590	..	10,000	20	400	4	Wl-ST	Wd-F	Yes	SC	No	Elias	None	....	..	....	Elias—Aircoupe
140	110	55	1050	13	17,500	160	900	20	Wl-ST	Wd-F	Yes	S-CP	Yes	Hy	F	....	61	....	Fairchild—FC-2W2 land
122	103	53	580	27	13,100	110	710	15.5	Wl-ST	Wd-F	Yes	S-CP	Yes	Hy	F	....	10	....	Fairchild—FC-2 land
125	105	40	..	.	....	84	750	10	Wl-ST	Wd	Yes	SC	Yes	Arl	....	....	..	....	Federal Aircraft—CM-1
115	95	35	800	14	16,000	56	600	....	DR-F	Wd-F	Yes	SCP	Ex.	O-S	E	$2500	Apl	5%	Gates—Day—New Standard
110	90	45	600	..	11,500	45	420	....	Wl-ST	Wd-F	Yes	DeD	B	O	....	....	..	....	Gillis—Crusader
135	115	55	1250	13	18,000	140	750	21	D-cor.	D-cor.	Yes	DePD	Yes	Arl	H	$3000	..	5%	Hamilton—H-45
140	120	55	.	11	18,500	140	700	24	D-cor	D-cor	Yes	DePD	Yes	Arl	H	$3000	..	5%	Hamilton—H-47
70	65	32	200	..	....	3.3	120	....	R-ST	Wd-F	No	SC	No	RC	....	....	..	....	Heath—Parasol
100	87	35	600	..	10,500	40	450	....	Wd	Wd-F	Yes	S	Ex.	O	....	....	35	....	International—F-17
125	110	40	850	..	14,000	67	500	....	Wd	Wd-F	....	S	Std.	O	....	....	Apl	....	International—F-18
98	85	46	650	35	11,000	65	500	12	ST-D	Wd-F	Yes	DeD	No	OC	....	....	Apl	5%	Ireland—Neptune
90	75	28	400	65	12,000	8	300	1.7	Wd	Wd-F	Yes	SC	....	RC	W	$175	..	6%	Irwin—M-T-2
112	..	..	800	..	14,000	60	..	....	Wl-ST	Wd-F	....	....	....	....	....	....	..	....	Keystone—Pronto
112	..	57	570	..	....	..	500	....	Wl-ST	Wd-F	....	....	....	....	s.	....	..	....	Keystone—Pathfinder
120	110	35	900	.	20,000	..	800	7	Wl-ST	Wd-F	....	....	S	Gr	....	....	..	....	Kinner—Courier
102	.	39	548	..	12,000	.	400	....	Wl-ST	Wd-F	Ex.	SD	No	RC	EH	$1,100	19	5% N	Kreider-Reisner—Challenger
130	10	40	1350	10	....	80	600	....	DT, S	Wd-F	....	SPA	....	....	....	....	..	....	E. M. Laird—Commercial
125	105	40	..	15	....	..	..	....	Wl-ST	Wd-F	Yes	DeD.	Std	RC	....	....	..	....	Laird—Whippoorwill
100	..	35	600	..	....	42	500	....	Wl-ST	Wd-F	....	....	....	....	....	....	28	....	Lincoln—Page
135	110	50	1000	16	15,900	100	700	10	W-mon.	Wd-P	Yes	SC	H	RC	E	....	Apl	5%	Lockheed—Vega
167	135	55	1460	10	17,250	100	1000	18	W-mon.	Wd-P	Yes	SC	H	RC	....	....	Apl	5%	Lockheed—Air Express
120	..	50	..	..	14,000	140	650	....	Wd-D	Wd-F	Yes	DeC	Ex.	RC	....	....	34	....	Loening—Amphibian
126	108	49	1000	..	16,000	83	700	10–11	Wl-ST	Wd-F	....	SC	B	Grs	E	$1,800	25	Yes	B. F. Mahoney—Ryan B/
140	120	48	1250	..	....	150	1000	18	Wl-ST ,D	D	Yes	DeDC	S	Arl	..	..	..	....	Metal—Flamingo
90	75	35	700	..	....	..	..	....	Wl-ST	Wd-F	Yes	S Pl	....	RAR	E	..	..	....	Mono Aircraft—Monocoupe
110	90	35	800	..	....	..	360	....	Wl-ST	Wd-F	Yes	S	Std	RC	..	....	..	....	Mohawk—Pinto
103	85	35	600	..	15,000	35	396	8	Wl-ST	Wd-F	No	S	No	RC	....	....	29	....	National Airways—Air King
85	..	30	925	..	....	..	360	....	Wl-ST	Wd-F	....	SC	Std	RAR	....	....	Apl	....	Nilee—Williams
100	90	35	500	25	12,500	38	400	9	Wl-ST	Wd-F	Ex.	SPD	Ex.	RC	EH	$1,000	36	....	Pheasant—H10
136	105	45	1600	..	11,000	60	600	....	Wl-ST	Wd-F	Yes	S	Yes	Arl	....	$900	18	5%	Pitcairn—PA-5
128	110	45	..	..	....	76	..	....	Wl-ST	Wd-F	Yes	S	....	Arl	....	....	..	....	Pitcairn—PA-6
101	82	45	..	..	....	35	400	....	Wl-ST	Wd-F		S	....	Grs	....	....	..	....	Pitcairn—PA-7
114	96	59	750	..	12,000	110	540	17	D-cor.	D-cor.	Yes	DeDC	Yes	P	....	....	..	....	Prudden—S-E-1
95	..	45	..	..	....	42	..	....	Wd-D	Wd-F	....	DeCP	....	....	....	....	..	....	Richmond Airways—Sea Hawk
122	112	58	650	..	15,000	370	790	50	DOR, B	DOR, B	....	De D	Hy	RDO	....	..	Apl	5%	Sikorsky—S37
125	110	55	880	15	19,400	200	500	36	Wd-D	DOR, B	Yes	DeD	....	DOS	WD	....	60	5%	Sikorsky—S38 Amphibion
125	110	40	1000	17	16,000	..	1250	5.5	Wl-ST	Wd-F	Yes	S	....	....	....	....	..	5%	Simplex—Red Arrow
104	95	30	..	15,000	....	40	400	....	Wl-ST	Wd-F	....	SD	....	HyC	....	....	..	....	Starling
110	90	38	625	..	12,000	50	500	7	Wl-ST	Wd-F	Yes	PC	St.	RHy	D	....	Apl	5%	Stearman—C-2-K
130	110	41	1000	..	18,000	65	620	11.5	Wl-ST	Wd-F	Yes	PC	St.	RHy	D	$1,200	Apl	5%	Stearman—C-2-B
125	105	56	900	..	14,000	90	750	11	Wl-ST	Wd-F	Yes	DeD	Std.	Hy	M	$2,500	74	....	Stinson—SM-1-D
110	90	46	500		13,500	42	500	7	Wl-ST	Wd-F	Yes	DS	Std.	Hy	....	....	48	5%	Stinson—Junior
115	100	37	800	12.5	18,000	50	600	8	Wl-ST	Wd-F	Yes	DS	No	RC	....	....	..	....	Spartan—C-3
114	100	55	..		14,000	235	540	30	D-cor.	D-cor.	Yes	DeD	St	O	....	....	..	....	Stout—Ford—4AT
100		35	600	..	....	36	500		Wl-ST	Wd-F				RC	....	....	21	....	Swallow—Commercial
110	100	38	850		....	30	500	6	Wl-ST	Wd-F	Yes	SP	....	RAR	....	....	..	Yes	Taylor Bros.—Chummy
..	..	..	..	..	....	50	..	....	Wl-ST	Wd-F	....	S	....	....	....	....	..	....	Texas—Temple
						120	..	....	D-cor.	D-cor		De	....	Grs.	....	....	..	....	Thaden Metal—T-1
114	95	40	800	20	15,000	43	440	10	Wl-ST	Wd-F	Yes	SpeD	Ex	R	EH Ex	$1,100	Apl	5%	Thunderbird W14-O
135	110	42	1000	16	16,000	60	440	15	Wl-ST	Wd-F	Yes	SpeD	Ex	R	EH Ex	$2,950	Apl	5%	Thunderbird W-14-H
100	..	42	..	..	12,000	42	410	8	Wl-ST	Wd-F	Yes	SPC	No	RC	....	....	30	....	Travel Air—2000
130	..	45	..	..	20,000	60	.	12	Wl-ST	Wd-F	Yes	SPC	No	RC	....	....	32	....	Travel—4000
128	107	50	700	..	13,500	78	650	12	Wl-ST	Wd-F	Yes	DeD	Yes	O	....	....	Apl	....	Travel Air—6000
105	..	42	..	..	....	66	650	....	Wl-ST	Wd-F	Yes	SPC	....	RC	....	....	38	....	Travel Air—Siemens
95	82	40	670	37	11,000	28	500	5.25	Wl-ST	Wd-F	Yes	SPD	....	Hy	....	..	..	....	Wallace—Touroplane
97	90	35	600	..	14,000	40	350	8	Wd WI8	Wd-F	No	S	....	C	E	....	Apl	5%	Whites—Humming Bird
95	85	30	600	20	12,000	..	500	8	Wl-ST	Wd-F	No	SC D	No	RC	Own	$1,000	No	5%	Western—King Bird
100	85	35	600	..	20,000	300	1000	20	Wl-ST	Wd-F	Yes	C	Yes	Arl	No	....	..	Yes	Zenith—Albatross

FUSELAGE AND WING CONSTRUCTION:
-Bolted
r.—Corrugated
-Duralumin
-Fabric cover
n—Monocoque
-Open section

BRAKES:
-Bendix
—Extra
-Hydraulic

P—Plywood cover
R—Riveted
S—Steel
T—Tubing
Wd—Wood
Wl—Welded

L—Lockheed
S—Sausedde
Std—Standard

LIGHTS:
N—Navigation lights

CONTROL:
A—Arens
C—Cables
D—Dual
De—Wheel
P—Push rods
S—Stick
Pl—Pedal

SHOCK ABSORBER.
Arl—Aerol
C—Cord
D—Compression
Grs—Gruss
Hy—Hydraulic
O—Oleo
P—Pneumatic
R—Rubber
RAR—Ruseo Aero Rings
S—Coil Spring
T—Trombone

PONTOONS:
D—Duralumin
E—Edo
F—Fairchild
H—Hamilton
M—All metal
W—Wood

TYPE CERTIFICATE:
Apl—Applied for and is pending

GUARANTEE:
N—New

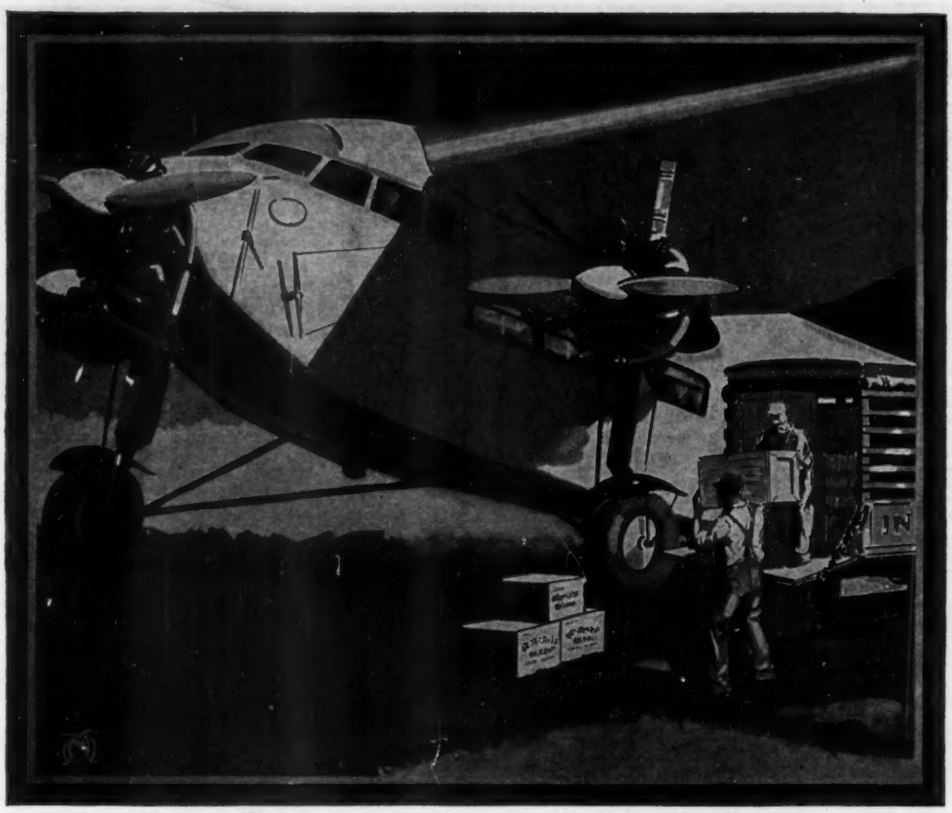
MANUFACTURERS' SPECIFICATIONS ON ENGINES AVAILABLE FOR COMMERCIAL USE AS COMPILED BY *AVIATION*

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT *AVIATION* DOES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN

This table will appear monthly and corrections and suggestions are invited

MANUFACTURER OR AGENT	Engine	Cooling System	Cylinder Arrangement	No. of Cylinders	No. of Cycles	Propeller Drive	Rated Hp. and R.P.M. at Sea Level	Maximum Hp. and R.P.M. at Sea Level	Weight Dry Without Hub or Starter	Weight Per Rated Hp.	Bore and Stroke (In.)	Compression Ratio	B.M.E.P.	Displacement (Cu. In.)	Frontal Area (Sq. Ft.)	Diameter of Mounting Ring or Distance Between Bearers (In.)	Height or Overall Diameter (In.)	Length Without Starter (In.)	Guaranteed Fuel Consumption at Rated Hp. Lb./Hp./Hr.	Oil Consumption Lb./Hp./Hr.	Valve Mechanism	Cylinder Construction (See Key)	No. Intake Valves Per Cylinder	No. Exhaust Valves Per Cylinder	Make Spark Plugs Supplied With Engine	Type of Ignition	Make Ignition	No. Carburetors	Make Carburetors	Make Starter	Are Exhaust Manifolds Provided	Shipping Weight Crated	Dept. of Commerce License	Cost at Factory
Aircraft Engine Co.	Comet	A	Rad	7	4	D	150-1800				4½x5½										prr	Al, S	1	1		2M	Se		Sy,E	Be			N	
Allison Engineering Co.	V1410	A	IV-45°	12	4	D	410-1800	430-1900	1000	2.44	4½x7	5.3	128	1410		17	46⅝	78½	.55	.03	ohe	Al, S	1	1	BG	2B	De	1	Sg²	Le			Y	
Allison Engineering Co.	VG1410	A	IV-45°	12	4	G¹	410-1800	430-1900	1125	2.62	4½x7	5.3	128	1410		17		85½	.55	.03	ohe	Al, S	1	1	BG	2B	De	1	Sg²	Le			Y	
Allison Engineering Co.	V1650	W	IV-45°	12	4	D	420-1700	450-1800	885	2.10	5 x7	5.4	122	1650		17	46⅞	74¼	.53	.025	ohe	Al, S	1	1	BG	2B	De	1	Sg²	Le			V	
Axelson Machine Co.	Axelson A7R	A	Rad	7	4	D	150-1800		430	2.87	4½x5½	5.0		612			48½	35								M	Se	1	Sg			750	N	
Brownback Motor Laboratories, Inc.*	Ansani 3-35	A	Rad	3	4	D	35-1700	45-1800	115	3.29	3¹⁵⁄₁₆x4¹³⁄₁₆	5.1		119		9.5	24¹³⁄₁₆	21 ¹³⁄₁₆	.53	.025	prr	S	1	1		2M	AS		Z		N			8735
Brownback Motor Laboratories, Inc.*	Ansani 6-80	A	Rad	6	4	D	80-1500	89-1600	215	2.69	4½x4⅝	5.1		397		10.6	35¹³⁄₁₆	29	.53	.027	prr	S	1	1		2M	AS		Z		N			1650
Brownback Motor Laboratories, Inc.*	Ansani 10-120	A	Rad	10	4	D	120-1500	131-1600	320	2.67	4½x5½	5.5		736		11.0	43⅛	34¹¹⁄₁₆	.60	.031	prr	S	1	1		2M	AS		Z		N			2170
Curtiss Aeroplane & Motor Co.	OX-5	W	V-90°	8	4	D	90-1400		375	4.17	4x5	4.9		502		12⅜			.55	.030	prr	Mo, C	1	1		1M			Z		N		Y	
Curtiss Aeroplane & Motor Co.	OXX6	W	V-90°	8	4	D	110-1900		390	3.55	4½x5	4.9		568		12¾			.55	.030		Mo, C	1	1		2M			Z		N		Y	
Curtiss Aeroplane & Motor Co.	C-6A	W	L	6	4	D	160-1700	165-1750	420	2.62	4½x6	5.2	133	573		15¾	39	57¹⁵⁄₁₆	.52	.015	ohe	Al, Al, S	2	2	AC	2M	Sp	1	Z	U	N	865	Y	
Curtiss Aeroplane & Motor Co.	D12	W	V-60°	12	4	D	435-2300	460-2500	680	1.47	4½x6	5.3	135	1145		15¾		58¾	.52	.015	ohe	Al, Al, S	2	2	BG	2M	Se	2	Sg	1 e	N	1080	Y	
Curtiss Aeroplane & Motor Co.	Conqueror	W	V-60°	12	4	D	600-2400	635-2450	760	1.26	5¼x6¼	5.8	130	1569		15¾		58¾	.52	.015	ohe	Al, Al, S	2	2	BG	1M	Sp	2	Z	Ee	N	1060	Y	
Curtiss Aeroplane & Motor Co. Inc.	Geared Conqueror	W	V-60°	12	4	G³	600-2400	625-2450	850	1.42	5¼x6¼	5.8	128	1569		15¾		58⅜	.52	.015	ohe	Al, Al, S	2	2	BG	1M	Sp	2	Sg	Ee	N	1150	Y	
Curtiss Airplane & Motor Co.	Chieftain	A	H	12	4	D	660-2200	615-2200	900	1.50	5½x5½	5.4	130	1690		23⅜	45⅛	51¼	.60	.025	ohe	Al, S	2	2	BG	D M	So	1	Sg	E	N	1325	Y	
Curtiss Airplane & Motor Co.	Challenger	A	Rad S	6	4	D	170-1800	180-1800	420	2.47	5½x4⅞	5.2	124	603		19	41¾	35⅔	.55	.020	prr	Al, S	1	1	BG	2M	Se	1	Sg	E	N	850	Y	
Curtiss Airplane & Motor Co.	Bear	A	L	4	4	D	110-1550	125-1800	375	3.41	4½x7	5.3	118	444		16	39	47⅝	.505	.0175	ohe	Al, NI	1	1		2M	Sp	1	Z	N	N	550		1600
Dayton Airplane Engine Co.	Caminez 447-C	A	Rad	4	4	D	120-960	140-1050	350	2.50	5½x4½	6.0	120	447	3.9	21½	36	35	.55	.035	prr	Al, S	1	1	AC	2M	Se	1	Sg¹	Le	X	775	Y	
Fairchild Caminez Eng. Corp.	H-526	A	Rad	7	4	D	130-1800		425	3.26	4½x5	5.2		526		18½	46	37			prr	C	1	1	BG	2M	BR	2	Z		N		N	1700
Hallet Mfg. Co.	Irwin 79	A	Rad	4	2	D	20-1700	25-2200	60	3.00	2¾x2¾	5.0	110	79	2.0	4⅞	23	11	.45	.031	Au	Aa, Aa, S	1	1	RB	1M	BR	1	Wf		N	100	N	625
Irwin Aircraft Co.	K-5	A	Rad	5	4	D	75-1725	112-1880	268	2.30	4.25x5.25	5.0		372		14	42				prr	Al, Al, S	1	1	CH	2M	Se	1	Sg	H	Y	400	Y	1875
Kinner Airplane & Motor Corp.	B-2 Salmson	A	Rad	9	4	D	260-1500	278-1760	542	2.08	4.92x6.69	5.2					46⅜	38¾	.42	.025	prr	Al, S	1	1		2M	O		Z					3,250
Menasco Motors Co.	SR-3	A	Rad	3	4	D	40-1800	45.6-1900	146	3.7	4½x4¾	4.8	100	191	2.3	9⅞		23¾	.57	.030	prr	C	1	1		2M	BR	1	Z	N	N	205		765
O. E. Szekely Corp.	1A-2775	W	X.60°	24	4	D	1200-2600	1300-2700	1500	1.15	5½x5	7	150	2775	6.22	14½	45¼	78⅛	.52	.03	ohe	S	2	2	BG	4B	Se	4	Sg	O	V		Y	25,000
Packard Motor Car Co.	3A-1500	W	V-60°	12	4	D	600-2500	650-2700	760	1.26	5¾x5½	5.5	140	1498	4.03	15¾	38¼	62¹¹⁄₁₆	.52	.015	ohe	S	2	2	BG	2M	Se	2	Sg	Ae	N	1275	Y	12,000
Packard Motor Car Co.	3A-1500	W	V-60°	12	4	G	600-2500	650-2700	880	1.46	5¾x5½	5.5	140	1498	4.03	15¾	38¼	65	.52	.025	ohe	S	2	2	BG	2B	De	2	Sg	Ae	N	1390	Y	17,375
Packard Motor Car Co.	3A-1500	W	V-60°	12	4	D	600-2500	650-2700	780	1.30	5¾x5½	5.5	140	1498	4.03	16¾	38¼	62¹¹⁄₁₆	.52	.025	ohe	S	2	2	BG	2M	Se	2	Sg	Ae	N	1275	Y	12,000
Packard Motor Car Co.	3A-2500	W	V-60°	12	4	D	800-2000	835-2100	1160	1.45	6¾x6½	5.7	135	2490	4.8	18½	36¾	69¾	.52	.015	ohe	S	2	2	BG	2M	Se	2	Sg	Ae	N	2150	Y	15,625
Packard Motor Car Co.	3A-2500	W	V-60°	12	4	G	800-2000	835-2100	1380	1.72	6¾x6½	5.7	135	2490	5.1	18¼	36¾	76½	.52	.015	ohe	S	2	2	BG	2B	De	2	Sg	Ae	N	2340	Y	19,375
Pratt & Whitney Aircraft Co.	Wasp	A	Rad	9	4	D	400-1900		670	1.67	5x5¾	5.2	124	1344		23⅝		43¾	.55	.035	prr	Al, S	1	1	BG	2M	Se	1	Sg		N	1150	Y	
Pratt & Whitney Aircraft Co.	Hornet	A	Rad	9	4	D	500-1900		760	1.52	6¼x6¾	5.0	123.5	1690		23⅝		44¾	.55	.035	prr	Al, S	1	1	BG	2M	Se	1	Sg		N	1325	Y	
Pratt & Whitney Aircraft Co.	Geared Hornet	A	Rad	9	4	G2	500-1900		835	½	⅝	5.0	123.5	1691		23⅝		41¾	.55	0.35	prr	Al, S	1	1	BG	2M	Se	1	Sg		N		Y	
Quick Motors Co.	Quick-Radial	A	Rad	9	4	D	125-1450		325	2.6	4.13x5.51	5		667		19⅝	36	36			prr	Al, S	1	1	CH	1M	Se	1	Z					1750
Siemens & Halske A.G.*	Siemens Sh 13	A	Rad	5	4	D	82-1750		246	3.01	4.13x4.72	5.3	110.5	317		14	39⅝	34	.52	.022	prr	Al, S	1	1	O	2M	O	2	Sm	O	Y	693	Y	
Siemens & Halske A.G.*	Siemens Sh 14	A	Rad	7	4	D	115-1750		308	2.68	4.13x4.72	5.3	108.0	443		14	39⅝	32	.52	.022	prr	Al, S	1	1	O	2M	O	2	Sm	O	Y	726	Y	
Siemens & Halske A.G.*	Siemens Sh 12	A	Rad	9	4	D	125-1750		382	3.05	3.94x4.72	5.3	109.5	517		14.6	40½	32	.50	.022	prr	Al, S	1	1	O	2M	O	2	Sm	O	Y	720	Y	
Spartan Aircraft Co.	Walter 5	A	Rad	5	4	D	70-1600		225	3.21	4.13x4.72	4.4	112	317		11.35	37	27.5	.50	.028	oh	Al, S	1	1	AC	2M	Se	1	So		Y	500	Y	1,835
Spartan Aircraft Co.	Walter 7	A	Rad	7	4	D	95-1600		280	2.95	4.13x4.72	4.4	108	444		12. 6	37	28.5	.49	.026	oh	Al, S	1	1	AC	2M	Se	1	Z		Y	580	Y	2,355
Spartan Aircraft Co.	Walter 9	A	Rad	9	4	D	135-1750		352	2.59	4.13x4.72	4.4	112	572		14.56	39	33.5	.49	.026	oh	Al, S	1	1	AC	2M	Se	1	Du		Y	670	Y	2,940
Tips & Smith, Inc.†	Super-Rhone	A	Rad	9	4	D	125-1450	133-1650	15	2.52	4½x5½	5.2		667	4.75	11		39	.31	.036	prr	S, C	1	1	Sp	1M	Dx	1	Z			400	N	2,250
Velie Motors Corp.	Velie M5	A	Rad	5	4	D	45-1750		210	4.66	4½x3⅝	5.2		250		12¾	39	27	.55	.025	prr	Al, S	1	1	AC	2M	Se	1	Z	Ee	Y	420	Y	1,050
Warner Aircraft Corp.	Scarab	A	Rad	7	4	D	110-1850	120-1925	270	2.45	4¼x4¼	5.2	112	422		17	35¼	27¾	.50	.01	prr	Al, S	1	1	AC	2M	Se	1	Sg		N			2,485
Wright Aeronautical Corp.	Whirlwind J5	A	Rad	9	4	D	200-1800	225-2000	500	2.50	4½x5½	5.2	128	788		19¼	45	33¾	.53	.035	prr	Al, S	1	1	AC	2M	Se	1	Sg		N	1000	Y	4,980
Wright Aeronautical Corp.	Cyclone R1750	A	Rad	9	4	D	525-1900	560-2000	760	1.52	5⅝x6¼	5.0	130	1753		23¾	53⅜	40¾	.55	.035	prr	Al, S	1	1	BG	2M	Se	1	Sg		N	1530	Y	

*—Engines of foreign manufacture
†—rebuilt
a—applied for
A—Air cooled
Aa—Aluminum alloy
Ae—Aeromarine
Al—Aluminum
AS—Ansani or Scintilla
Au—Automatic
B—Battery ignition
BR—Robert Bosch
Be—Scintilla booster magneto
C—Cast iron
Ch—Champion
Cylinder Construction
first—head
second—walls or waterjacket
third—sleeve, if any
D—Direct
De—Delco
Du—Duplex
Dx—Dixie
DM—Dual Magneto
Ee—Eclipse
E—Ensign
G—Geared
G¹—5:3 epicyclic gear
G²—2:1 reduction gear
G.E.—General Electric
H—Hexagonal
I—Inverted
L—Cylinders in line
Mo—Monel
M—Magneto
NI—Nickle Iron
N—No
O—Own
ohe—Overhead cam
prr—Push rods and rocker arms
Rad—Radial
Rad S—Staggered Radial
Se—Scintilla
Sg—Stromberg
Sg¹—Stromberg NA-U5 duplex
Sg²—Stromberg NAS-SE
Sm—Sum
So—Solex
Sp—Splitdorf
S—Steel
U—U.S.L. Electric
V—Vee
W—Water cooled
Wf—Winfield
X—Extra
Y—Yes
Z—Zenith



AMERICAN BUSINESS *takes to the Air*

THE American business man is learning that the day of one hundred miles an hour air transport is here.

Airplanes are carrying a great variety of commodities, ranging from food products to machinery; from lingerie to automobile parts; from currency and bonds to golf balls. A rush order for ermine trimming brought pelts from New York to San Francisco in thirty-two hours. Lingerie fresh from New York style shops has been on display in Montana stores within thirty-six hours.

In this tremendous growth of air transport, fuel and lubrication have been important factors. In the future expansion of aviation, fuel and lubrication are likewise going to play influential roles.

The Standard Oil Company (Indiana) has long appreciated the importance of fuel and lubrication in airplane performance. When Stanolind Aviation Gasoline, Stanolind and Superla Aero Oils were offered to pilots it was with this company's belief and assurance that these products were as nearly perfect for air service as research and human ability could make them.

In fulfilling their appointed tasks, Stanolind Aviation Gasoline and Aero Oils have set up a service record that every pilot will appreciate.

See Our Exhibit

The Standard Oil Company (Indiana) will exhibit at the International Aeronautical Exposition to be held at the Chicago Coliseum December 1st to 9th.

Stop and have our representative explain the respective merits of Stanolind Aviation Gasoline, Stanolind and Superla Aero Oils.

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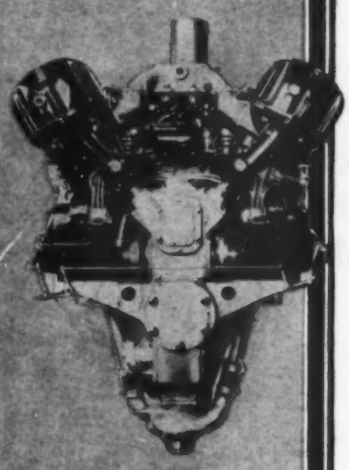

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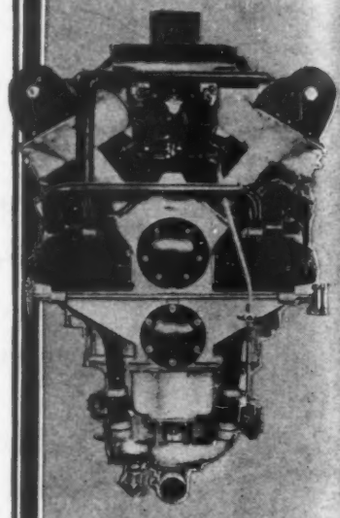

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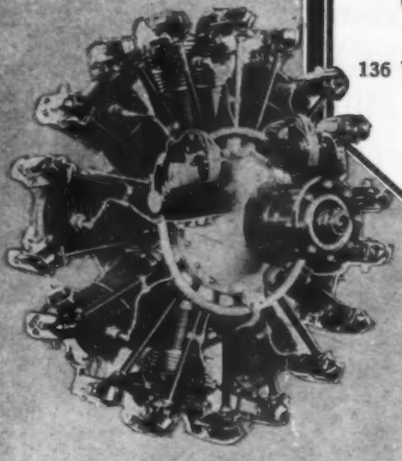

Wright
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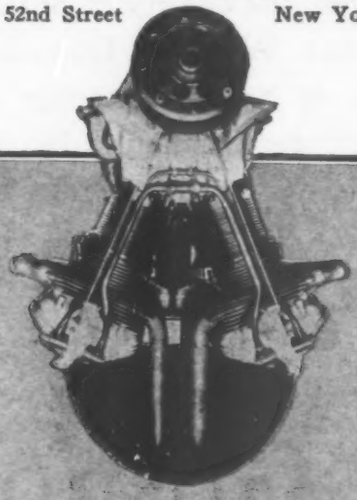

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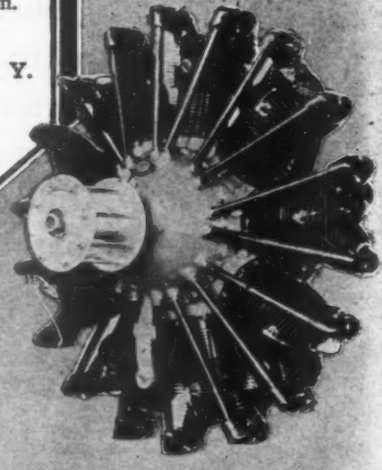

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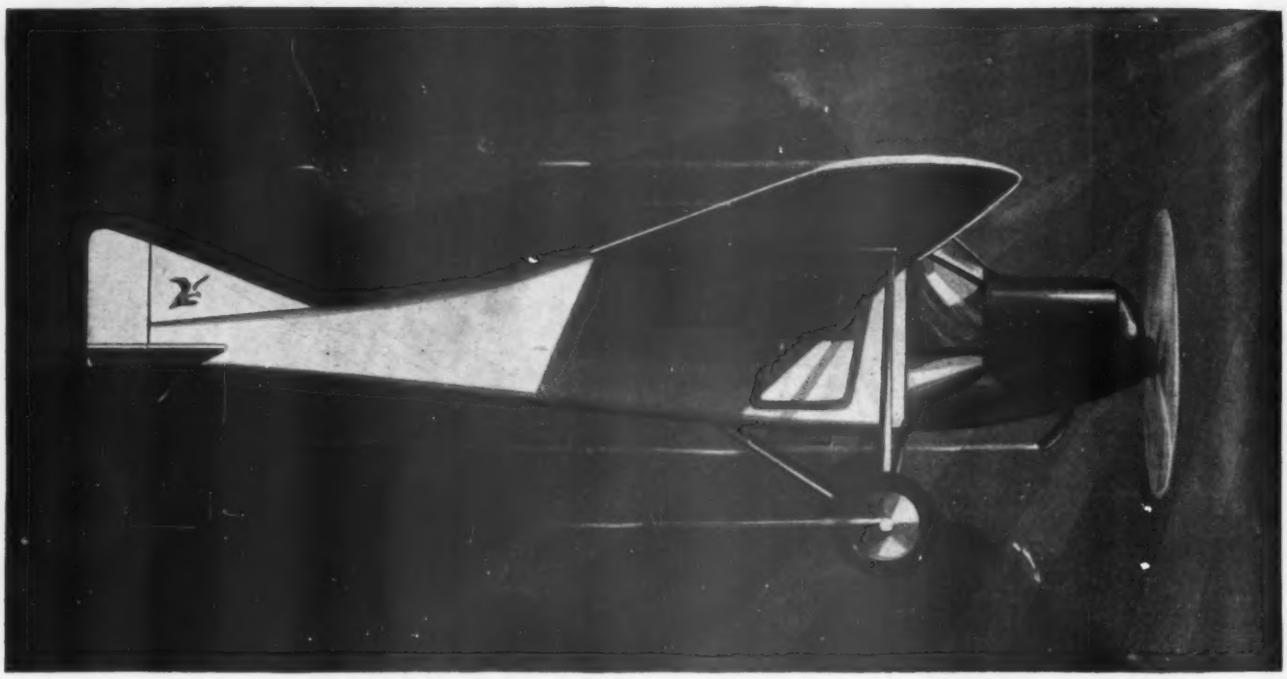

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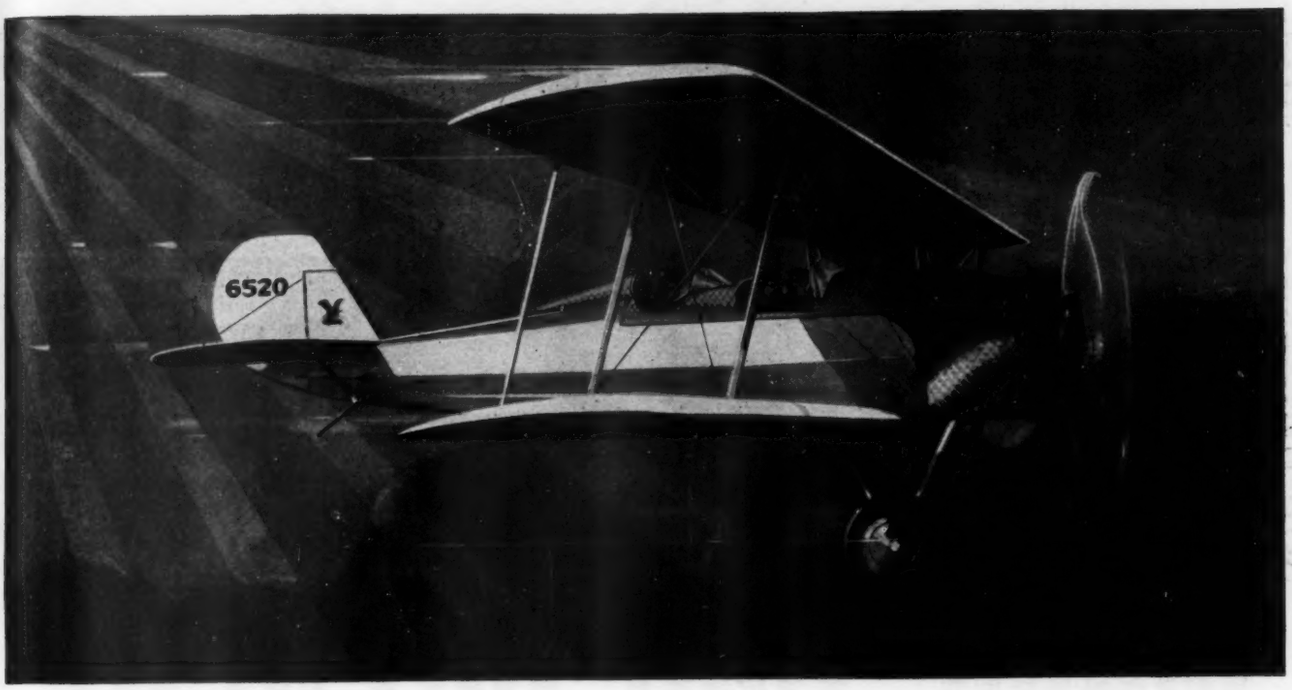

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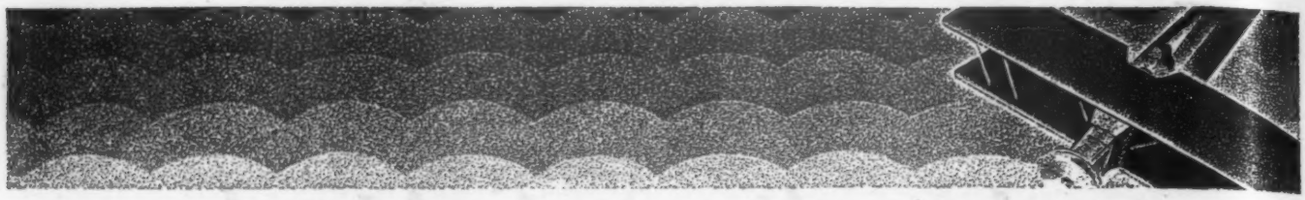
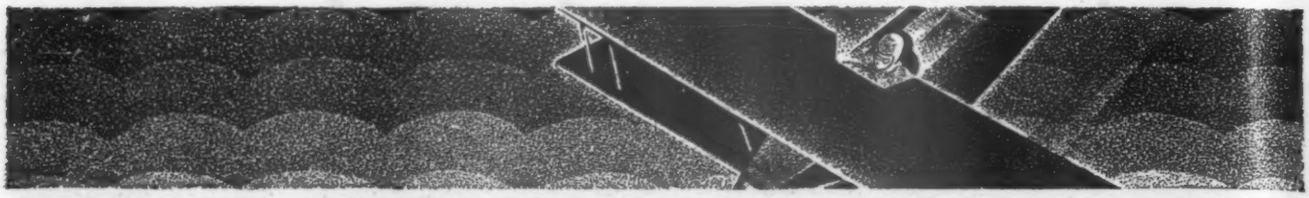


1 *When you full-throttle along some fine Winter's day . . .*

2 *And the temperature starts looping the loop around zero . . .*



3 *And you're wearing a trick helmet that doesn't come down far enough . . .*

4 *And it leaves about an inch or so of your manly brow exposed . . .*

5 *And the cold air starts to rally around that exposed brow . . .*

6 *And your forehead becomes temperamental, developing aches and pains . . .*

Don't blame your forehead

blame your helmet

THE coldly annoying trouble pictured above can always be side-slipped by wearing the right kind of helmet — by wearing a Winter Helmet made by Spalding.

Spalding Winter Helmets are really air-minded. They fit snugly. They fit warmly. And they fit all the way down to the goggle line.

Spalding Winter Helmets are warm buddies to temperamental foreheads. And they'll be buddies for a long, long time.

For a Spalding helmet practically refuses to wear out. Ten dollars will buy an excellent one.

Spalding has, of course, a complete stock of flying equipment. See it at our stores carrying flying equipment—New York, Chicago, Detroit, San Francisco, and Wright & Ditson, Special Distributors, 344 Washington Street, Boston. Or write for a catalog. ©1928, A. G. S. & B.

South African capeskin leather outer shell. Lined throughout with electrified lamb fur. Two goggle straps, one long, one short. Leather chin strap, with buckle. Price, $10.

A. G. Spalding & Bros.

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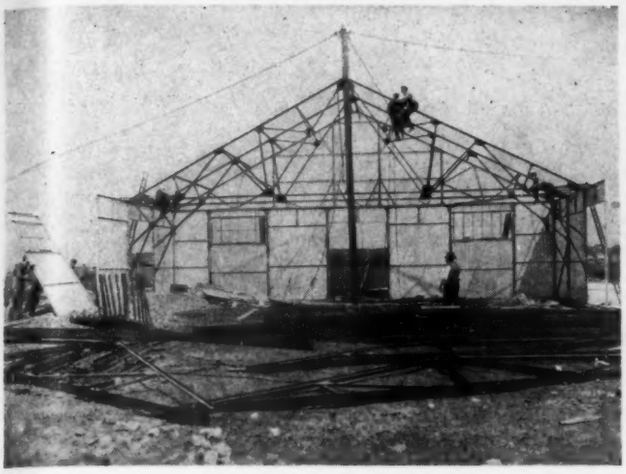
Shepard Sectional Steel Hangars



Erection View

Completed Building

Can Be Erected by Unskilled Labor, Even in Cold and Stormy Winter Weather

AS time goes on many airports will be moved nearer to the cities, also there will often arise cases where it is advisable to change the location of hangars or to enlarge them. It is, therefore, of the utmost importance for hangars to be of such construction that they can be taken down and re-erected without loss of material and at a minimum cost of labor.

For the past ten years the ARTHUR B. SHEPARD CORPORATION has been manufacturing structural steel industrial buildings and service stations in sectional form and they are now erected in forty states in the Union. Many of these, after years of service, have been moved to new locations without loss of material and also added to from time to time.

We are now furnishing sectional steel airplane hangars designed and fabricated along the same correct engineering lines, in such a complete manner that they can be readily erected, taken down and re-erected with unskilled labor.

SHEPARD HANGARS are similar to our industrial buildings except the front of the hangars consists of sliding steel doors which open the entire width of the building with wheels at the bottom of the doors operating on steel tracks, guide wheels and rails at the top.

We do not make shipment of loose angles, channels, steel sheets and sash and then leave it to the customer to assemble and rivet the steel work in the field, apply the sheets to the girts on the sides of the building with clips or wrapping straps, fit and set in the sash, etc., requiring skilled labor, which field work often costs the customer as much additional as he pays for the building f. o. b. factory, but we ship to you a complete building with about 80% erection work already done in our shops.

Finished Wall Section

That is, SHEPPRD HANGARS are complete sectional buildings which can be quickly erected with unskilled labor. The side walls consist of steel sections 8 feet in width, 12 feet and 15 feet 8 inches in height, of heavy channels and rolled steel angles hot riveted together with ¼" gusset plates in our shops and the steel ventilated sash and galvanized beaded steel sheets are copper riveted to these sections before shipment.

To erect SHEPARD HANGARS start at the rear and raise and bolt together end sections (bolting bottom girts to anchor bolts in foundation), then bolt together a few sections on each side; raise gable end truss, which is also sheeted with galvanized steel sheets, then raise and bolt on the first main truss, bolt on the roof purlins and braces, then raise some more side wall sections, raise next truss and so on (see picture showing erection view), after which hang the sliding doors at front of the building, apply roof sheets and glaze the sash, and the building is ready for business.

We furnish with each hangar all the necessary bolts and nuts, glass, putty and a complete set of tools such as wrenches, drift pins, pliers, putty knives, etc.

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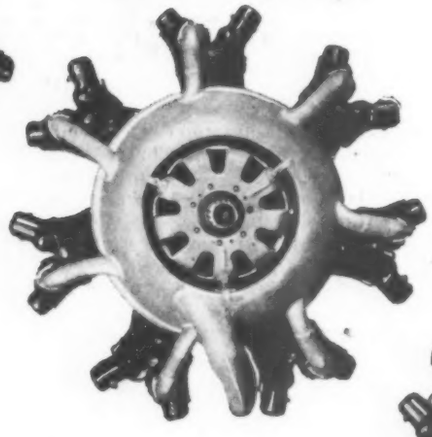

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